

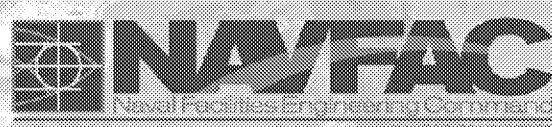
# GROUNDWATER MONITORING REPORT SECOND QUARTER 2007

Government Gas Station Building 631  
Naval Base Ventura County  
Point Mugu Facility  
Point Mugu, CA

DCN: TN&A-1105-0007-0007

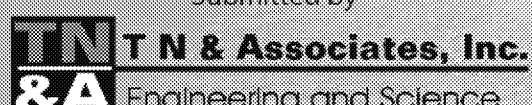
Prepared for  
California Regional Water Quality Control Board  
Los Angeles Region  
Technology Information Unit

On behalf of



U.S. DEPARTMENT OF THE NAVY  
Naval Facilities Engineering Command Southwest  
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Submitted by



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October 2007

**GROUNDWATER MONITORING REPORT  
THIRD QUARTER 2007**

Government Gas Station Building 631  
Naval Base Ventura County Point Mugu Facility  
Point Mugu, CA  
SLIC No. 282 File No. 98-017

**GENERAL WASTE DISCHARGE  
REQUIREMENTS (WDR) PERMIT**

Order No. R4-2005-0030,  
Series No. 020, CI No. 8906

I certify under penalty of law that this document, including all attachments and supplemental information, was prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of a fine and imprisonment.

Executed on the 27<sup>th</sup> day of September, 2007

at Point Mugu, CA

J. Star Kanado  
(Signature)

Environmental Engineer  
(Title)

# DRAFT FINAL GROUNDWATER MONITORING REPORT THIRD QUARTER 2007

Government Gas Station Building 631  
Naval Base Ventura County Point Mugu Facility  
Point Mugu, CA

DCN: TN&A-1105-0007-0007

Prepared for:



U.S. DEPARTMENT OF THE NAVY  
Naval Facilities Engineering Command Southwest  
1220 Pacific Highway  
San Diego, California 92132-5187

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## EXECUTIVE SUMMARY

On behalf of the United States Department of the Navy (DON), Naval Facilities Engineering Command Southwest (NAVFACSW), T N & Associates, Inc. (TN&A) prepared this Groundwater Monitoring Report for the third quarter of 2007 to document the implementation of subsurface sulfate injections and to present the results of the groundwater monitoring performed at the Government Gas Station Building 631 (the Site) located at Naval Base Ventura County (NBVC) Point Mugu Facility, Point Mugu, CA. This report was prepared in accordance with the General Waste Discharge Requirements (WDR) Permit No. R4-2005-0030, and the Monitoring and Reporting Program (MRP) No. 8906 issued on July 8, 2005 by the Los Angeles Regional Water Quality Control Board (LARWQCB).

The purpose of the sulfate injection program is to add sulfate to the groundwater plume and to harness sulfate-reducing bacteria to treat the gasoline-impacted shallow groundwater at the Building 631 Site. The field activities and results of the sampling performed at the Building 631 Site up to the third quarter of 2007 are summarized as follows:

- Baseline groundwater sampling was conducted between October 23 and 24, 2006.
- Subsurface injections of magnesium sulfate and sodium sulfate were performed between January 15 and 24, 2007.
- Approximately 210 pounds of sodium sulfate and 150 pounds of magnesium sulfate were injected as a 4,800-gallon solution via five (5) injection points and seven (7) injection wells.
- Post-injection sampling events included: Week #1 (February 1, 2007), Week #4/First Quarter 2007 (February 20-21, 2007), Month #2 (March 21 and 29, 2007), Month #3/Second Quarter 2007 (April 24-25, 2007), and Third Quarter 2007 (July 10-11, 2007). Groundwater gauging and sampling occurred during each event.
- Groundwater gauging data collected on July 10, 2007 indicated a relatively flat gradient (0.0006 ft/ft) at the Site with an overall apparent flow direction towards the northeast. The groundwater elevations determined during the Third Quarter 2007 event averaged approximately 0.14 feet lower than the Baseline data. The average Third Quarter 2007 groundwater elevations were 0.45 feet lower than the Second Quarter 2007 elevations.
- Based on the comparison of the field and analytical results for the baseline and post-injection sampling events conducted within six (6) months following completion of the injection activities, the implementation of the sulfate injection program appears to have improved the subsurface conditions thus enhancing bioremediation processes at the Site. The overall decrease in ORP levels and increase in sulfate concentrations within the treatment area indicate that groundwater conditions at the Site are favorable for the enhanced natural bioremediation processes. These results suggest that the substrate was delivered effectively to the subsurface and that anaerobic conditions are being established. In addition, groundwater concentrations of the Site primary contaminants decreased except for benzene and TBA detected at the concentrations similar to baseline levels in MW-2 located within the treatment area. TPH-GROs were only detected in MW-2 and IP-D during the Third Quarter 2007 event.

The next sampling event will be conducted during the fourth quarter of 2007 and the next report will be submitted by January 15, 2008.

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- Appendix C Los Angeles Regional Water Quality Control Board Monitoring Schedule

## **Acronyms and Abbreviations**

°C	degree Celsius
ASL	American Scientific Laboratories, Inc.
BTEX	benzene, ethylbenzene, toluene, and xylenes
CAP	Corrective Action Plan
CTO	Contract Task Order
DIPE	di-isopropyl ether
DO	dissolved oxygen
DON	Department of the Navy
EMAC	Environmental Multiple Award Contract
EMAX	EMAX Laboratories, Inc.
ETBE	ethyl tert-butyl ether
ft bgs	feet below ground surface
ft/ft	feet/foot
ft bmp	feet below measuring point
GC/FID	gas chromatography/flame ionization detection
GC/MS	gas chromatography/mass spectrometry
gpm	gallon per minute
IR	Installation Restoration
LARWQCB	Los Angeles Regional Water Quality Control Board
LCD	laboratory control sample duplicate
LCS	laboratory control sample
µg/L	microgram per liter
mg/L	milligram per liter
MgSO <sub>4</sub> • 7 H <sub>2</sub> O	magnesium sulfate heptahydrate
MNA	monitored natural attenuation
MRP	Monitoring and Reporting Program
MS	matrix spike
MSD	matrix spike duplicate
MSL	mean sea level
MTBE	methyl tert-butyl ether
mV	millivolt
N	Nitrogen
NAS	Naval Air Station
Na <sub>2</sub> SO <sub>4</sub>	sodium sulfate
NBVC	Naval Base Ventura County
NAVFACSW	Navy Facilities Engineering Command Southwest
NFESC	Naval Facilities Engineering Service Center
ORP	oxidation-reduction potential
psig	pounds per square inch gauge
PVC	polyvinyl chloride
QA/QC	quality assurance and quality control
QC	quality control
RPM	remedial progress monitoring
RAOs	remedial action objectives



### **Acronyms and Abbreviations (Continued)**

TAME	tert-amyl methyl ether
TBA	tert-butyl alcohol
TDS	total dissolved solids
TN&A	T N & Associates, Inc.
TPH-GROs	total petroleum hydrocarbons-gasoline range organics
TSS	total suspended solids
TtEMI	Tetra Tech EMI
URS	URS Corporation
UST	underground storage tank
VOCs	volatile organic compounds
WDR	Waste Discharge Requirements

## 1.0 INTRODUCTION

On behalf of the United States Department of the Navy (DON), Naval Facilities Engineering Command Southwest (NAVFACSW), T N & Associates, Inc. (TN&A) prepared this Groundwater Monitoring Report, Third Quarter 2007, to document the implementation of sulfate injection activities and to present the remedial progress results for the groundwater sampling conducted at Government Gas Station Building 631 located at the Naval Base Ventura County (NBVC) Point Mugu Facility in Point Mugu, California. This report was prepared in accordance with the General Waste Discharge Requirements (WDR) Permit Order No. R4-2005-0030 issued on July 8, 2005 by the Los Angeles Regional Water Quality Control Board (LARWQCB).

TN&A has received a Contract Task Order (CTO) 0007 from the NFECSW, under the Environmental Multiple Award Contract (EMAC), Contract No. N68711-04-D-1105. Under this CTO, TN&A performed sulfate injections and groundwater monitoring at the Building 631 Site at the NBVC Point Mugu Facility in Point Mugu, CA in accordance with the following project documentation:

- WDR Permit Order No. R4-2005-0030 issued by LARWQCB dated July 8, 2005 (LARWQCB, 2005),
- Corrective Action Plan (CAP) for Building 631, Naval Air Station (NAS) Point Mugu, CA prepared by URS Corporation (URS) on May 26, 2004 (URS, 2004),
- Work Plan for Sulfate Injections and the Third Quarter Groundwater Monitoring at Building 631, NAS Point Mugu, CA prepared by URS on February 8, 2005 (URS, 2005),
- The Addendum 1 to Work Plan for Sulfate Injections and Groundwater Monitoring (TN&A, 2006a), and
- Health and Safety Plan for Sulfate Injections and Groundwater Monitoring (TN&A, 2006b).

The purpose of the sulfate injections is to add sulfate to the groundwater plume and to harness sulfate-reducing bacteria to treat the gasoline impacted shallow groundwater at the Building 631 Site. The operation and maintenance of the remediation effort at the Building 631 Site is under the coordination of:

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## **1.1 REMEDIAL ACTION OBJECTIVES (RAOs) AND PROJECT SCOPE**

In accordance with approved CAP (URS, 2004), the remedial action objectives (RAOs) for the Site include the following:

- To implement the most technically feasible technology for the Site cleanup;
- To reduce residual concentrations in the soil to levels that do not pose threats to human health or the environment;
- To contain and reduce the groundwater plume to the extent practicable based on applicable guidance (shrinking or stable); and
- To obtain closure for the Site after the aforementioned RAOs are achieved.

No RAO concentration values were established for the Site primary contaminants in the CAP (URS, 2004).

To meet the project-specific RAOs, TN&A was tasked to implement an enhanced bioremediation program and an associated groundwater monitoring program at Building 631, NBVC Point Mugu Facility in Point Mugu, California. The enhanced bioremediation system selected for the Site involves the subsurface injection of magnesium sulfate and sodium sulfate solutions to stimulate naturally occurring bioremediation of petroleum fuel hydrocarbons.

The primary groundwater contaminants at the Site are benzene, ethylbenzene, toluene and xylene (BTEX) compounds, methyl tert-butyl ether (MTBE), tert-butyl alcohol (TBA), and di-isopropyl ether (DIPE). LARWQCB approved the injection of aqueous magnesium sulfate and sodium sulfate solutions into the shallow "semi-perched" aquifer, via injection wells and horizontal injection lines located within the underground storage tank (UST) excavation area (General WDR Permit No. R4-2005-0030 Series No. 020, CI No. 8906 issued on July 8, 2005 by LARWQCB).

To monitor the enhanced bioremediation progress and to meet the requirements of the General WDR Monitoring and Reporting program (MRP) No. CI-8906, the Quarterly Groundwater Monitoring Program (LARWQCB, 2002 and 2004) provided in Appendix C, and the LARWQCB-approved Work Plan (URS, 2005), a comprehensive groundwater monitoring program was initiated. Table 1 summarizes the groundwater monitoring program details. The quality control (QC) and field sampling procedures focus on achieving the data quality objectives described in Addendum 1 to the Work Plan (TN&A, 2006a) in a timely, cost-effective, and safe manner. All field activities will be documented in quarterly and annual reports in accordance with the General WDR Permit reporting requirements.

## **1.2 PROJECT SITE LOCATION AND HISTORY**

The NBVC Point Mugu Facility is located in Ventura County, California, approximately 50 miles northwest of Los Angeles (Figure 1). The NBVC Point Mugu Facility is bordered by Highway 1 on the north and east, the Pacific Ocean on the south and west, and a Ventura County Game Reserve on the west and northwest. This facility comprises approximately 4,500 acres and contains 897 buildings, including 568 housing units (Tetra Tech EMI [TtEMI], 2004). Many buildings were constructed on top of dredged material and other man-made fill.

The Government Gas Station Building 631 Site is a gasoline service station located at the NBVC Point Mugu Facility. The Site includes a fuel pump island and an adjacent aboveground fuel farm. Building 631 is located in the east-central portion of the NBVC Point Mugu Facility, approximately three quarters (3/4) of a mile north of the Pacific Ocean as illustrated in Figure 2.

## **1.3 PREVIOUS INVESTIGATIONS**

Since March 2002, several investigations have been conducted at the Site and have included the following:

- Removal of the 12,000-gallon double wall fiberglass gasoline UST, product piping, and dispenser islands, and the replacement of these structures. These activities were conducted between March and April of 2002. Petroleum hydrocarbon impacted soils were excavated and transported off-site for disposal, and confirmation soil sampling was completed.
- Assessment of the extent (vertical and lateral) of petroleum hydrocarbon impacted soil and groundwater beyond the limits of the initial remedial excavation. Delineation of the soil and groundwater plumes was conducted in three (3) phases as follows:
  - The initial phase was conducted in August of 2002 with the installation of groundwater wells MW-1 through MW-5.
  - The second phase was conducted in March of 2003 to assess the northern extent of the groundwater plume with the addition of three (3) groundwater monitoring wells (MW-6 through MW-8).
  - The third and last phase was conducted in November 2003 and included the installation of two (2) groundwater wells further north of MW-6 (MW-9 and MW-10).
  - Monitoring wells MW-15 and MW-16 and injection wells IW-11 through IW-14 were installed by URS prior to TN&A taking over the project in 2006.

- Assessment of petroleum hydrocarbon concentrations in groundwater through periodic groundwater monitoring.

Details of these assessment activities and the concentrations and extents of petroleum hydrocarbons in soil and groundwater beneath the Site were summarized in the CAP (URS, 2004).

#### **1.4 DESCRIPTION OF ENHANCED BIOREMEDIATION**

The enhanced bioremediation technology chosen for the Site involves the injection of magnesium sulfate and sodium sulfate to the groundwater plume to promote biostimulation of sulfate-reducing bacteria. Sulfate-reducing bacteria utilize sulfate as an oxidizing agent to produce sulfide and require organic compounds as a source of carbon and energy. Due to the increased bioavailability of sulfate in the groundwater, more sulfate will be reduced and thus, the bioremediation of the gasoline-contaminated groundwater at the Site will be enhanced.

Metabolic processes involve the transfer of electrons from an electron donor to an electron acceptor. The most common electron acceptor is oxygen. Once oxygen levels are depleted, microorganisms will use nitrate, insoluble manganese, ferric iron, sulfate, and carbon dioxide as the electron acceptor in the following sequence:

- Oxygen to Nitrate Reduction: As available oxygen is consumed, the active aerobic bacteria shift to nitrate respiration. The denitrification will continue until the nitrate or useable carbon is depleted;
- Nitrate to Manganese Reduction: As the nitrate is depleted, manganese-reducing bacteria will become active until the concentrations of manganese oxide become limiting;
- Manganese to Iron Reduction: Iron reduction becomes predominant once all the manganese oxides are depleted. Bacterial Mn(IV) respiration also appears to be limited to areas where sulfate is virtually absent;
- Iron to Sulfate Reduction: Iron reduction continues until it is limited by the substrate or by carbon availability. Sulfate reduction then becomes dominant;
- Sulfate Reduction to Methanogenesis: Once sulfate or useable carbon is depleted, methanogenic bacteria become dominant.

Sulfate-reducing bacteria require anaerobic conditions to degrade organic compounds. The introduction of sulfate compounds into the subsurface will create favorable conditions for the bacteria causing increased biodegradation of the site-specific contaminants.

## **2.0 SITE PHYSICAL SETTING**

Site description information presented in Sections 2.1 and 2.2 below was taken verbatim from the Corrective Action Plan for Building 631 (URS, 2004). Please refer to this document for a detailed discussion of regional geology and hydrogeology.

### **2.1 TOPOGRAPHY AND SURFACE WATER**

Topographic map coverage of the Site is provided by the U.S. Geological Survey 7½ Minute Series Point Mugu, California Quadrangle Map (photo revised 1974). The Site is located at an elevation of approximately 10 feet above mean sea level (MSL), with a gentle ground surface gradient to the south. The nearest surface water body is Mugu Lagoon, which is located approximately a half mile south and southeast of the Site. Callegues Creek is located approximately a half mile east of the Site.

### **2.2 SITE GEOLOGY AND HYDROGEOLOGY**

Based on the data collected during previous investigations, soil at the Site consists of poorly graded sands with silt, clayey sands, clays, and silts to depths up to 15 feet below ground surface (ft bgs). The Site is generally underlain by poorly graded sand with silt and silty sand down to approximately 4 to 6 ft bgs, with clay and silt noted down to a maximum depth of approximately 10.5 ft bgs, except in the vicinity of MW-1. Clayey sand was observed in MW-1 from approximately 4 to 10 ft bgs. Clayey sand and poorly graded sand with clay was encountered from approximately 10.5 to 12.5 ft bgs. Poorly graded sands and sands with silt were encountered from approximately 12.5 to 15 ft bgs, except in MW-2 where clayey sand was also observed from approximately 8 ft bgs to the total depth of the boring (15.5 ft bgs).

Since September 2002, twelve (12) groundwater monitoring wells have been installed at the Site (Figure 3). The well construction summary is provided in Table 2. On July 28, 2006 a land surveyor registered in the State of California (Sage Consultants, Inc.) conducted a survey of new groundwater monitoring and injection wells, i.e., MW-15, MW-16, IW-11 through IW-16. Survey data are also provided in Table 2. Due to discrepancies between previous survey data of other Site wells and measurements taken in the field, Sage Consultants checked and re-calculated well casing elevations for previously surveyed groundwater monitoring wells. Survey methodology for all data presented in Table 2 is consistent with other surveyed sites at the NBVC Point Mugu Facility such as Installation Restoration (IR) Site 6 (Building 311 Yard) and IR Site 24 (Former UST 23 and 55 Sites).

Measured static groundwater levels from the groundwater monitoring wells have ranged from the lowest recorded level of 6.90 feet below the surveyed measuring point (ft bmp) at monitoring well MW-7 in September 2004 to the highest recorded level of 3.85 ft bmp at monitoring wells MW-3 in March 2003. A summary of the measured static water levels collected at the Site and respective calculated groundwater elevations are presented in Table 3. To date, free product has not been encountered in any of the groundwater monitoring wells.

Since the initiation of quarterly groundwater monitoring in September 2002, the groundwater gradient direction has been predominately to the north, except during the March and December 2003 sampling event (URS, 2005). In March 2003, the gradient direction was reported towards the south (URS, 2005). The apparent change in flow direction in March 2003 coincided with the highest recorded water levels measured in the Site monitoring wells. In December 2003, a subtle mounding in the groundwater surface was observed in the vicinity of monitoring well

MW-1, MW-7, and MW-8 with a radial groundwater flow direction to the south, west, and north (URS, 2005).

Adjacent to Building 631 (along the east side) there is an area of periodic recharge resulting from irrigation of the grass. The limited recharge may result in periodic mounding of the water table in the vicinity of MW-1, and may be adding fresh water to the subsurface.

## **3.0 SULFATE INJECTIONS**

All injection activities were performed in accordance with the General WDR Permit No. R4-2005-0030 Series No. 020, CI No. 8906 issued on July 8, 2005 by LARWQCB.

### **3.1 OVERVIEW**

Based on the historical groundwater monitoring results from sampling events conducted by TN&A and other consultants, the injection of sulfate compounds to the gasoline-impacted groundwater at the Building 631 Site will likely enhance naturally occurring bioremediation processes. Magnesium sulfate and sodium sulfate were selected as appropriate sulfate-based compounds for bioremediation within the source area and downgradient of the source area, respectively. The sulfate compounds were mixed with groundwater that was extracted from MW-3 and injected into the subsurface between January 15 and 24, 2007.

### **3.2 BATCH SULFATE INJECTIONS**

Groundwater, extracted from MW-3, was added to a graduated, above-ground polyethylene storage tank. The sulfate-based chemicals were mixed with the extracted groundwater in the tank using a mechanical mixer. The sulfate solutions were pumped directly from the tank into the on-site wells and horizontal piping using an injection pump.

A total of 150 pounds of magnesium sulfate heptahydrate ( $\text{MgSO}_4 \cdot 7 \text{H}_2\text{O}$ ) was added to the source area and 210 pounds of sodium sulfate ( $\text{Na}_2\text{SO}_4$ ) was added downgradient of the source area. Approximately 4,800 gallons of sulfate solutions were injected between January 15 and January 24, 2007. The pumping rates ranged from 4 gallons per minute (gpm) to 6.5 gpm for all wells except for IP-A, which was measured at 2 gpm. The injection pressures were very minimal (<0.5 pounds per square inch gauge [psig]) in all wells with the exception of IP-A, which was measured at 13 psig.

#### **3.2.1 Source Area Injections**

Between January 15 and 17, 2007, the dissolved-phase groundwater plume within the source area was treated by injecting a total of 150 pounds of magnesium sulfate heptahydrate in 2,400 gallons of groundwater extracted from MW-3. The solution was injected into the five-point below grade polyvinyl chloride (PVC) horizontal injection piping network located within the former excavation area and in groundwater monitoring well MW-1 (see Figure 4).

The polyethylene storage tank was filled with 400 gallons of extracted groundwater and approximately 25 pounds of magnesium sulfate were added to the tank. This solution was thoroughly mixed and 400 gallons of solution were injected into each of the following five (5) injection points and one (1) monitoring well: IP-A, IP-B, IP-C, IP-D, IP-E, and MW-1 (Figure 3).

To ensure that the injections did not cause significant groundwater mounding, pressure was monitored at the PVC injection points and water levels were measured at the perimeter wells. After the completion of the subsurface injections, sufficient volumes of extracted groundwater from MW-3 were flushed into the five (5) injection points to displace the magnesium sulfate solution from the injection piping/hose and to displace two (2) horizontal injection pipe volumes (two [2] well volumes for MW-1).

Documentation of field measurements, observations, and activities are provided in Appendix A. The injection volumes and quantities of sulfate substrate injected are shown in Table 4.



### **3.2.2 Downgradient Plume Injections**

Between January 22 and 24, 2007, the downgradient portion of the dissolved phase groundwater plume was treated by injecting 210 pounds of sodium sulfate in 2,400 gallons of groundwater extracted from MW-3. The solution was injected into the newly installed injection wells (IW-11, IW-12, IW-13, and IW-14) and into monitoring wells MW-6 and MW-7 (Figure 3). A 400-gallon solution of extracted groundwater and 35 pounds of sodium sulfate was added to the PVC tank and the solution was thoroughly mixed and injected into each well.

Wellhead pressures were monitored and water levels at the perimeter wells were monitored to ensure that the injection did not cause significant groundwater mounding. Sufficient volumes of extracted groundwater from MW-3 were flushed to displace the sodium sulfate and to displace two (2) well volumes.

Documentation of field measurements, observations, and activities are provided in Appendix A. The injection volumes and quantities of sulfate substrate injected are shown in Table 4.

## 4.0 GROUNDWATER MONITORING PROGRAM

The following sections present the groundwater sampling methods implemented at the Building 631 Site. The groundwater monitoring program is designed to meet requirements of the MRP No. CI-8906 (LARWQCB, 2005), the Quarterly Groundwater Monitoring Program (LARWQCB, 2002 and 2004), the approved Work Plan (URS, 2005), and the approved Addendum 1 to the Work Plan for Sulfate Injections and Groundwater Monitoring (TN&A, 2006a). The MRP and quarterly monitoring schedule are provided in Appendix C.

### 4.1 SAMPLING PROCESS DESIGN

The data obtained from the remedial progress monitoring (RPM) program will provide information to evaluate the performance of the sulfate injection program. Groundwater monitoring wells were selected to generate analytical results within the treatment area, cross-gradient to the treatment area, upgradient of the treatment area and downgradient of the treatment area.

The MRP No. CI-8906 includes collecting groundwater samples from the following wells for the on-site water quality parameter measurements and for the off-site laboratory analyses:

- MW-4 - upgradient well,
- MW-2 - within the treatment area,
- MW-9 - downgradient well, and
- MW-10 - downgradient well.

The off-site laboratory analyses for groundwater samples include:

- a. Volatile organic compounds (VOCs; SW8260B),
- b. Total petroleum hydrocarbons - gasoline range organics (TPH-GROs; SW8015M),
- c. Anions: dissolved sulfide (EPA 376.2); o-phosphate (EPA 365.3); sulfate, chloride, nitrate as nitrogen (N), nitrite as N, bromide, and iodide (EPA 300.0),
- d. Cations: barium, calcium, magnesium, manganese (dissolved and total), potassium and sodium (SW6010B), and
- e. Total suspended solids (TSS; EPA 160.2) and total dissolved solids (TDS; EPA 160.1).

The analyte list for the VOC group includes the site-specific contaminants (BTEX compounds and fuel oxygenates). Monitoring concentrations of sulfate and methane will help to estimate sulfate reduction and methanogenesis rates. The sulfide concentrations in the groundwater may increase due the anaerobic reduction of sulfate.

In accordance with the MRP, groundwater elevations are measured in the field for all twelve (12) monitoring wells (MW-1, MW-2, MW-3, MW-4, MW-5, MW-6, MW-7, MW-8, MW-9, MW-10, MW-15, and MW-16).

In accordance with the quarterly groundwater sampling program, groundwater samples from MW-1, MW-3, MW-5, MW-6, MW-7, and MW-8 are analyzed for the aforementioned on-site water quality parameter measurements and for off-site laboratory analyses with the exception of

TSS (EPA 160.2) and TDS (EPA 160.1). In addition, the following analyses are performed on ten (10) wells on a quarterly basis between July 2006 and April 2007:

- a. Alkalinity (total; EPA 310.1),
- b. Ammonia as N (EPA 350.3),
- c. Biological Oxygen Demand (EPA 405.1),
- d. Iron and manganese (total and dissolved; SW6010B), and
- e. Methane (dissolved; RSK 175).

In July 2007, in addition to wells MW-2, MW-4, MW-9, and MW-10, quarterly monitoring was conducted for MW-1, MW-3, MW-5, MW-6, MW-7, MW-8, and two injection wells located within the former UST excavation area (IP-C and IP-D). The reduced analyte list for the quarterly groundwater monitoring included:

- a. Volatile organic compounds (VOCs; SW8260B),
- b. Total petroleum hydrocarbons - gasoline range organics (TPH-GROs; SW8015M),
- c. Anions: dissolved sulfide (EPA 376.2); sulfate, nitrate as N, and nitrite as N (EPA 300.0), and
- d. Methane (dissolved; RSK 175).

In accordance with the MRP, field measurements include dissolved oxygen (DO), oxidation-reduction potential (ORP), pH, and temperature. Monitoring water quality delivers comprehensive information about the general groundwater chemistry and subsurface environmental conditions prior to and during the sulfate injections.

## **4.2 GROUNDWATER SAMPLING METHODS**

Following well gauging activities and prior to sample collection, each sampled monitoring well was purged using the low-flow purging (i.e., micro-purge) method, the objective of which was to minimize stress to the groundwater system by minimizing drawdown caused by pumping. During purging, in-line water quality parameters such as temperature, pH, DO, and ORP were monitored continuously in a flow-through cell with a Horiba U-22™ instrument. Depth to water and water quality parameters were measured until water quality parameters stabilized to within  $\pm 10\%$  for three (3) consecutive readings. All field readings are included on the field sampling sheets provided in Appendix A.

After parameter stabilization, samples were transferred into the appropriate sample containers and were placed immediately on ice to sustain a temperature of  $4 \pm 2$  degrees Celsius ( $^{\circ}\text{C}$ ). Under appropriate chain of custody protocol, the samples were transported to EMAX Laboratories, Inc. (EMAX) located in Torrance, CA. This laboratory is a California State and Naval Facilities Engineering Service Center (NFESC) certified analytical laboratory. Groundwater samples were analyzed for the analyte groups discussed in Section 4.1 and Table 1.

## **5.0 GROUNDWATER MONITORING RESULTS**

The sulfate injections were performed between January 15 and 24, 2007. The sulfate delivery program involved injections via five (5) injection points, four (4) injection wells and three (3) groundwater monitoring wells. Following the sulfate injections, a groundwater monitoring program was initiated in February 2007 and the following sampling events have been completed in accordance with the MRP summarized in Table 1:

- Baseline - prior to injection activities (October 23-24, 2006),
- Week #1 - one (1) week after injection activities (February 1, 2007),
- Week #4 - four (4) weeks after injection activities (February 20-21, 2007),
- Month #2 - two (2) months after injection activities (March 21 and 29, 2007), and
- Month #3 - three (3) months after injection activities (April 24-25, 2007).
- Third Quarter 2007 - six (6) months after injection activities (July 10-11, 2007).

In addition to the WDR groundwater sampling described in Table 1, the quarterly groundwater sampling was performed between February 20 and 21, 2007, between April 24 and 25, 2007, and between July 10 and 11, 2007.

Field and analytical results for the baseline and post-injection groundwater sampling events are discussed in the following subsections. Field forms are provided in Appendix A and laboratory reports are enclosed in Appendix B.

### **5.1 GROUNDWATER GAUGING RESULTS**

This section presents gauging results for the baseline and post-injection sampling events. Per MRP No. CI-8906, groundwater elevations were measured in the following twelve (12) groundwater monitoring wells: MW-1, MW-2, MW-3, MW-4, MW-5, MW-6, MW-7, MW-8, MW-9, MW-10, MW-15, and MW-16 (Table 3). Graph 1 presents groundwater elevation data for all RPM wells. Groundwater elevation isocontour maps are presented in Figure 4 for data collected during the Baseline (October 23, 2006), Week #1 (February 1, 2007), Month #3 (April 24, 2007), and Third Quarter 2007 (July 10, 2007) events of the monitoring program.

#### **5.1.1 Baseline Gauging**

On October 23, 2006, TN&A recorded depths to groundwater that ranged from 5.62 to 6.16 ft bmp in the twelve (12) groundwater monitoring wells. Based on the calculated groundwater elevations, the apparent groundwater gradient is rather flat and generally flows towards the north-northeast between 0.00087 and 0.0019 ft/ft. During the previous sampling event (July 24, 2006), depth to water measurements varied between 4.98 and 5.12 ft bmp. The groundwater elevations determined in October 2006 averaged approximately 0.81 feet higher than the previous event in July 2006. Historical groundwater elevation data are provided in Table 3, and Figure 4 illustrates interpreted groundwater elevation contours and inferred flow direction. The historical groundwater elevation data are presented in Graph 1.

#### **5.1.2 Post-Injection Gauging**

The following post-injection gauging events were performed: Week #1 (February 1, 2007), Week #4/First Quarter 2007 (February 20, 2007), Month #2 (March 29, 2007), Month #3/Second

Quarter 2007 (April 24, 2007), and Third Quarter 2007 (July 10, 2007). All twelve (12) groundwater monitoring wells at the Site were gauged during each event. The following are static groundwater depth ranges for each sampling event:

- From 4.43 ft bmp (MW-9) to 4.85 ft bmp (MW-7) on February 1, 2007,
- From 4.22 ft bmp (MW-10) to 5.25 ft bmp (MW-4) on February 20, 2007,
- From 5.14 ft bmp (MW-5) to 5.60 ft bmp (MW-7) on March 29, 2007,
- From 5.14 ft bmp (MW-5) to 5.52 ft bmp (MW-7) on April 24, 2007, and
- From 5.52 ft bmp (MW-5) to 5.97 ft bmp (MW-7) on July 10, 2007.

The groundwater elevation measurements are summarized in Table 3, and Figure 4 illustrates the interpreted groundwater elevation contours and inferred flow directions. The historical groundwater elevation data are presented in Graph 1.

Calculated groundwater elevations for the July 10, 2007 event suggest groundwater beneath the site flowed towards the northeast at an approximate gradient of 0.0006 ft/ft (Figure 4). The groundwater elevations determined in July 2007 averaged approximately 0.45 feet lower than the previous event in April 2007.

## **5.2 GROUNDWATER ANALYTICAL RESULTS**

This section presents analytical results for the baseline and post-injection monitoring events conducted at the Government Gas Station Building 631 Site.

### **5.2.1 Baseline Sampling**

Baseline data represent groundwater contaminant concentrations before the subsurface injections of sulfate-based compounds were performed to evaluate the effectiveness of the enhanced bioremediation in reducing contaminant concentrations at the Site. In accordance with MRP No. 8906, four (4) wells (MW-2, MW-4, MW-9 and MW-10) were sampled for baseline concentrations in July 2006 or August 2006, prior to the sulfate injections completed between January 15 and 24, 2007. In addition to the monitoring conducted in accordance with MRP, ongoing quarterly monitoring continues to be performed.

The following concentration ranges for the site-specific contaminants were detected during October 2006 sampling event (Table 5 and Figure 5):

- TPH-GROs were detected in monitoring wells MW-1 (36 micrograms per Liter [ $\mu\text{g/L}$ ]), MW-2 (270  $\mu\text{g/L}$ ) and MW-6 (110  $\mu\text{g/L}$ ). TPH-GRO detections fell below the reporting limits and thus are considered quantitative estimates.
- Low BTEX levels were detected in three (3) out of the ten (10) sampled wells. Well MW-2 contained benzene at 52  $\mu\text{g/L}$ , ethylbenzene at 1.9  $\mu\text{g/L}$  (2.2  $\mu\text{g/L}$  in a duplicate), and toluene and xylenes below reporting limits of 2.5  $\mu\text{g/L}$ . Well MW-5 contained ethylbenzene at 1.0  $\mu\text{g/L}$  and benzene, toluene and xylenes below their respective detection limits, and well MW-6 contained benzene at 89  $\mu\text{g/L}$ , ethylbenzene at 14  $\mu\text{g/L}$ , and toluene and xylenes below the respective detection limits.
- MTBE was detected in five (5) out of ten (10) monitoring wells: MW-1 (6.4  $\mu\text{g/L}$ ), MW-2 (33  $\mu\text{g/L}$ ), MW-6 (1.4  $\mu\text{g/L}$ ), MW-7 (12  $\mu\text{g/L}$ ), and MW-8 (8.1  $\mu\text{g/L}$ ).

- TBA was detected in five (5) out of ten (10) wells monitoring wells: MW-1 (120 µg/L), MW-2 (140 µg/L), MW-6 (8.4 µg/L), MW-7 (85 µg/L), and MW-8 (11 µg/L).
- Estimated concentrations of DIPE were detected in groundwater samples collected at MW-2 (1.4 µg/L), MW-6 (2.4 µg/L) and MW-7 (0.86 µg/L).
- Ethyl tert-butyl ether (ETBE) and tert-amyl methyl ether (TAME) were not detected above method detection limits in any of the samples.

Historical concentrations of TPH-GROs, benzene, MTBE and TBA are presented in Graphs 2 through 5.

The following are the Baseline results for the monitored natural attenuation (MNA) parameters (Table 5 and Figure 6):

- The sulfate concentration in source area well MW-2 of 170 milligrams per liter (mg/L) appears to be depleted relative to the sulfate concentrations ranging from 403 to 544 mg/L in downgradient wells MW-7 and MW-8. Additionally, the detection of sulfide at 0.609 mg/L in MW-2 confirms that sulfate reducing processes are on-going. Based on the historical results (Table 5), sulfate levels have been increasing, suggesting a slower rate of sulfate reduction as the concentrations of TPH-GROs, BTEX compounds, and fuel oxygenates have been decreasing.
- The dissolved methane concentration in MW-2 of 2,100 µg/L is high relative to the concentrations in the downgradient wells (MW-15 and MW-16), cross-gradient wells (MW-5 and MW-8), and upgradient well (MW-4). Elevated methane levels have been consistently detected at MW-2 since the groundwater monitoring was initiated in September 2002.
- The field parameters for MW-2 included DO at 1.64 mg/L, ORP at negative (-) 133 millivolts (mV), pH at 7.10 and temperature at 24.3°C. The low DO levels suggest that active biodegradation had occurred or that there had been a depletion of oxygenated water at the Site (anaerobic conditions). Negative ORP readings indicate a reducing environment, further suggesting that the groundwater plume is under anaerobic conditions.

Field forms are provided in Appendix A and laboratory reports and chain of custodies are included in Appendix B.

### **5.2.2 Post-Injection Sampling**

Groundwater samples were collected, according to the sampling program discussed in Section 4.1, from select wells to monitor the effectiveness of the sulfate injections. In accordance with MRP No. 8906, four (4) wells (MW-2, MW-4, MW-9 and MW-10) were sampled at the frequencies described in Section 5.0. In addition to the monitoring conducted in accordance with the MRP, quarterly monitoring of selected groundwater wells was performed. The third quarter of 2007 sampling event was conducted between July 10 and 11, 2007.

The following concentration changes for the site-specific contaminants were determined within the treatment area:

- TPH-GRO levels decreased from an estimated concentration of 36 µg/L (Baseline) to below the reporting limit of 50 µg/L in well MW-1,

- TPH-GRO levels have shown an overall decrease in MRP well MW-2 from an estimated concentration of 270 µg/L (Baseline) to 140 µg/L (Third Quarter 2007),
- TPH-GRO levels decreased from an estimated concentration of 110 µg/L (Baseline) to below the reporting limit of 50 µg/L in well MW-6,
- Benzene concentrations in monitoring well MW-2 decreased from 52 µg/L (Baseline) to 38 µg/L (Third Quarter 2007),
- Benzene concentrations decreased in well MW-6 from 89 µg/L (Baseline) to an estimated concentration of 0.25 µg/L (Third Quarter of 2007),
- Ethylbenzene concentration in MRP well MW-2 decreased to 0.91 µg/L (Third Quarter 2007),
- Ethylbenzene concentration decreased from 14 µg/L (Baseline) to below the detection limit of 0.5 µg/L (Third Quarter 2007) in well MW-6,
- MTBE levels in well MW-1 decreased from 6.4 µg/L (Baseline) to 3.5 µg/L (Third Quarter 2007),
- MTBE concentrations in MW-7 decreased from 12 µg/L (Baseline) to 7.4 µg/L (Third Quarter 2007),
- TBA concentrations in MW-1 decreased from 120 µg/L (Baseline) to an estimated concentration of 16 µg/L (Third Quarter 2007),
- TBA concentrations in MRP well MW-2 decreased from 140 µg/L (Baseline) to below the detection limit of 20 µg/L (Month #3), and subsequently increased to 160 µg/L (Third Quarter 2007), and
- TBA concentrations in well MW-7 decreased from 85 µg/L (Baseline) to 42 µg/L (Third Quarter 2007).

All other concentrations of TPH-GROs, MTBE, and TBA from the sampled wells within the treatment area were detected at levels comparable to the baseline data. Toluene, xylenes, ETBE, and TAME were not detected above the reporting limits.

No site-specific contaminants were detected in upgradient well MW-4. In addition, no detections of site-specific contaminants were determined in cross-gradient and downgradient wells, with the exception of the following detections:

- MTBE levels in well MW-8 decreased from 8.1 µg/L (Baseline) to 3.2 µg/L (Third Quarter 2007),
- TBA concentrations decreased from 11 µg/L (Baseline) to below the detection limit of 20 µg/L (Third Quarter 2007) in MW-8,
- Ethylbenzene was detected at 1.4 µg/L in MW-5 during the Second Quarter of 2007 compared to the baseline concentration of 1.0 µg/L, and subsequently decreased to below the reporting limit of 0.50 µg/L during the Third Quarter of 2007, and
- DIPE was detected at an estimated concentration of 0.43 µg/L in MW-10. This low concentration of DIPE has historically been detected in MW-10 since July 2006.

As indicated by the analytical results for samples collected at wells MW-1, MW-2, and MW-6 (within the groundwater plume area), concentrations of the primary site contaminants have decreased significantly since the October 2004 sampling event, as follows:

Analytes	Concentrations Ranges (µg/L) for MW-1, MW-2, and MW-6					
	10/2004	7/2006	Baseline 10/2006	Week #4 2/2007	Month #3 4/2007	Month #6 7/2007
TPH-GROs	580 - 6,100	< 50 - 300	36 J - 270 J	< 50 - 93	< 50 - 100	< 50 - 140
Benzene	69 - 2,700	< 0.5 - 23	< 0.5 - 89	< 0.5 - 4.8	< 0.5 - 8.4	< 0.5 - 38
Ethylbenzene	64 - 890	< 0.5 - 1.3 J	< 0.5 - 14	< 0.5 - 25	< 0.5 - 5.1	< 0.5 - 0.91
MTBE	0.65 J - 120	0.29 J - 48	1.4 - 33	0.84 - 30	0.39 J - 28	0.30 J - 36
TBA	< 10 - 280	< 20 - 84	8.4 - 140	< 20 - 150	< 20 - 27	< 20 - 160

**Note:**

J – Result was qualified as a quantitative estimate.

During the Third Quarter 2007 sampling event, groundwater samples were collected from injection points IP-C and IP-D which are both located within the former UST excavation area as shown in Figure 3. A baseline groundwater sample had been previously collected on January 15, 2007 from IP-C prior to the sulfate injections and was submitted to American Scientific Laboratories, Inc. (ASL) for VOCs by SW 8260B, TPH as gasoline (C<sub>4</sub>-C<sub>12</sub>) by SW 8260B, and sulfate by EPA 300.0.

The following concentrations for the site-specific contaminants were determined within the excavation area (Table 5):

- TPH as gasoline by SW 8260B (gas chromatography/mass spectrometry) was detected at a concentration of 335 µg/L during the baseline event (January 15, 2007) and TPH-GROs by SW 8015M (gas chromatography/flame ionization detector) were not detected above the reporting limit of 50 µg/L during the Third Quarter 2007 event (July 11, 2007) in injection point IP-C. Despite the differences in analysis methods this significant decrease likely indicates degradation of TPH compounds within the excavation area,
- TPH-GROs were detected at a concentration of 350 µg/L (Third Quarter 2007) in IP-D, which is located adjacent to the former location of the UST,
- Benzene concentrations decreased from 64.6 µg/L (Baseline) to below the reporting limit of 0.50 µg/L (Third Quarter 2007) in IP-C,
- Ethylbenzene concentrations decreased from 1.3 µg/L (Baseline) to below the reporting limit of 0.50 µg/L (Third Quarter 2007) in IP-C,
- All BTEX compounds were detected in IP-D (Third Quarter 2007) at concentrations ranging from 0.90 µg/L (toluene) to 7.0 µg/L (benzene).
- MTBE concentrations decreased from 37.4 µg/L (Baseline) to below the reporting limit of



2.0 µg/L (Third Quarter 2007) in IP-C. and

- MTBE was detected at an estimated concentration of 0.45 µg/L in IP-D during the Third Quarter 2007 sampling event.

Sulfate levels in IP-C increased from 50.9 mg/L (baseline) to 522 mg/L in July 2007 indicating that the sulfate injections did increase sulfate levels within the excavation area of the Site. Sulfate was also detected in IP-D at a concentration of 602 mg/L.

Groundwater samples were also analyzed for sulfate concentrations to determine the effectiveness of the sulfate injection program. As shown in the table below and in Graph 6, the sulfate concentrations in wells utilized for injections (MW-1, MW-6, and MW-7) increased significantly within 4 weeks following injection activities. The sulfate concentration increase indicates that the sulfate substrates were effectively delivered to the subsurface. Based on the current monitoring data, the addition of sodium sulfate at the dosage levels prescribed in the Work Plan (URS, 2005) appeared to increase the sulfate concentration more effectively than the addition of magnesium sulfate ( $\text{MgSO}_4 \cdot 7 \text{H}_2\text{O}$ ) based on the following:

- Higher dosage of sodium sulfate prescribed the Work Plan (URS, 2005), i.e., a total of 210 pounds of sodium sulfate and 150 pounds of magnesium sulfate, and
- Higher efficiency of sodium sulfate to provide sulfate. Based on stoichiometric calculations, 1 pound of sodium sulfate yields 2.8 moles of sulfate and 1 pound of magnesium sulfate heptahydrate yields 1.8 moles of sulfate. Approximately 273 moles of sulfate were injected within the source area, and 604 moles were injected within the downgradient area.

Well ID	Sulfate Compound	Sulfate Concentration (mg/L)				Concentration Difference (mg/L)		
		Baseline	Week #4	Month #3	Month #6	Baseline to Week #4	Baseline to Month #3	Baseline to Month #6
MW-1	$\text{MgSO}_4 \cdot 7 \text{H}_2\text{O}$	146	280	112	131	134	-34	-15
MW-6	$\text{Na}_2\text{SO}_4$	91.8	339	289	291	247.2	197.2	199.2
MW-7	$\text{Na}_2\text{SO}_4$	544	950	542	608	406	-2	64

Well MW-1 is located near the irrigated lawn area of the Site and therefore, the measured sulfate concentrations may be diluted as a result of the lawn watering activities.

The Month #6 sulfate concentrations have increased in all injection wells, however the sulfate concentration in MW-1 remains below the baseline concentration likely due to dilution as described above. The sulfate concentration in MW-6 for Month #6 has remained elevated at 291 mg/L.

Sulfate concentrations in the MRP well MW-2 located within the treatment area decreased from 170 mg/L (October 2006) to 59.3 mg/L (Week #4) and subsequently increased to 127 mg/L (Month #6). The sulfate concentration in MW-2 (127 mg/L) is low compared to the sulfate concentration in wells within the same vicinity including MW-6 (291 mg/L), MW-7 (608 mg/L),

and MW-8 (473 mg/L) for Month #6 (see Figure 6). The decrease in sulfate levels may be due to on-going sulfate reduction processes as indicated by consistent detections of sulfide in MW-2.

As illustrated in Graph 6, fluctuations in sulfate concentrations were observed in the upgradient, cross-gradient, and downgradient wells, likely due to tidal influences given the proximity of the Site to the Pacific Ocean.

The DO concentration in MW-2 showed an overall decrease from 1.64 mg/L to 0.11 mg/L, and the ORP decreased from negative (-) 133 mV to negative (-) 218 mV when comparing Baseline (July/August 2006) and the Third Quarter 2007 (July 2007) data. These results indicate that reducing conditions are being established in the source area, thus enhancing bioremediation processes at the Site. Dissolved oxygen concentrations also decreased in MW-1 and MW-6 which are both located within the source area. Future data will be used for further evaluation of MNA parameters. Since the concentrations of TPH-GROs and BTEX compounds has been generally decreasing in the source area of the Site since the injection of the sulfate compounds, the positive impacts of the sulfate injection program are becoming apparent.

The distribution of TPH-GROs, BTEX compounds, and fuel oxygenates in groundwater are presented in Figure 5 and the distribution of MNA parameters in groundwater are presented in Figure 6. In addition, historical concentrations of TPH-GROs, benzene, MTBE and TBA are presented in Graphs 2 through 5. Field forms are provided in Appendix A and laboratory reports and chain of custodies are included in Appendix B.

### **5.3 QA/QC SAMPLE RESULTS**

As a part of the groundwater monitoring activities, field quality assurance and quality control (QA/QC) samples included a field duplicate sample from well MW-2 (Sample ID: MW-22), and two (2) laboratory-prepared trip blank samples (Sample IDs: MW-23 [July 10, 2007] and MW-23 [July 11, 2007]). Historical quality control (QC) field duplicate results are presented in Table 6. The field duplicate sample was analyzed for VOCs by EPA Method SW8260B and TPH-GROs by EPA Method SW8015M. The trip blank was analyzed only for VOCs, and VOCs were not detected. Relative percent difference values were calculated for the positively detected compounds in the field duplicate sample pairs and they did not exceed 25%.

Laboratory QA/QC samples for water matrix included method blanks, laboratory control sample (LCS), LCS duplicate (LCD), matrix spike (MS), and MS duplicate (MSD). No contamination was detected in the method blanks. In addition, all percent recoveries and relative percent difference values for LCS/LCD and MS/MSD were within method-specified control limits with exception of dissolved methane on July 10, 2007 due to the high concentration of the parent sample and nitrite as N on July 10, 2007.

Concentrations that are detected above method detection limits, but below the reporting limits are qualified as quantitative estimates and flagged with "J" (Table 5). The laboratory reports and chain of custody are included in Appendix B. All sampling was performed in accordance with the Navy-approved Work Plan (URS, 2005) and the Addendum 1 to the Work Plan (TN&A, 2006a).

### **5.4 GEOTRACKER SUBMITTALS**

In accordance with LARWQCB requirements, quarterly groundwater results will be uploaded to the Geotracker database along with the final hard copy version of this report.

## 6.0 SUMMARY AND CONCLUSIONS

In accordance with WDR Permit No. R4-2005-0030, MRP No. CI-8906 issued by the LARWQCB this report is submitted to document enhanced bioremediation field activities performed during the reporting period July 2007 through September 2007 at the Government Gas Station, Building 631 NBVC in Point Mugu, CA. Subsurface injections of the sulfate-based compounds to enhanced bioremediation processes was approved to address contamination with site-specific contaminants defined as TPH-GROs, BTEX compounds, MTBE, TBA, DIPE, ETBE, and TAME.

The field activities and results of the sampling performed at the Building 631 Site, including activities performed during the Third Quarter of 2007, are summarized as follows:

- Baseline groundwater sampling was conducted between October 23 and 24, 2006.
- Subsurface injections of magnesium sulfate and sodium sulfate were performed between January 15 and 24, 2007.
- Approximately 210 pounds of sodium sulfate and 150 pounds of magnesium sulfate were injected as a 4,800-gallon solution via five (5) injection points and seven (7) injection wells.
- Post-injection sampling events included: Week #1 (February 1, 2007), Week #4/First Quarter 2007 (February 20-21, 2007), Month #2 (March 21 and 29, 2007), Month #3/Second Quarter 2007 (April 24-25, 2007), and Third Quarter 2007 (July 10-11, 2007). Groundwater gauging was also performed during each of these events.
- Groundwater gauging data collected on July 10, 2007 indicated a relatively flat gradient (0.0006 ft/ft) at the Site with an overall apparent flow direction towards the northeast. The groundwater elevations determined during the Third Quarter 2007 event averaged approximately 0.14 feet lower than the Baseline data. The average Third Quarter 2007 groundwater elevations were 0.45 feet lower than the Second Quarter 2007 elevations.
- Based on the comparison of the field and analytical results for the baseline and post-injection sampling events conducted within six (6) months following completion of the injection activities, the implementation of the sulfate injection program appears to have improved the subsurface conditions thus enhancing bioremediation processes at the Site. The overall decrease in ORP levels and increase in sulfate concentrations within the treatment area indicate that groundwater conditions at the Site are favorable for the enhanced natural bioremediation processes. These results suggest that the substrate was delivered effectively to the subsurface and that anaerobic conditions are being established. In addition, groundwater concentrations of the Site primary contaminants decreased except for benzene and TBA detected at the concentrations similar to baseline levels in MW-2 located within the treatment area. TPH-GROs were only detected in MW-2 and IP-D during the Third Quarter 2007 event.

The next sampling event will be conducted during the fourth quarter of 2007 and the next report will be submitted by January 15, 2008.

## 7.0 REFERENCES

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**Figures**  
**(Separate PDF File)**

## Tables

**Table 1**  
**Groundwater Sampling Program**  
**Government Gas Station, Building 631, NBVC Point Mugu Facility, Point Mugu, CA**

Sampling Frequency	Total Events	Groundwater Wells	Matrix	Analysis & Method
<b>Monitoring And Reporting Program No. CI-8906</b>				
Baseline*, Week # 1, Week # 4, Month # 2, Month # 3, and Quarterly	7	MW-2, MW-4, MW-9, and MW-10	Water	VOCs by SW8260B TPH-GROs by SW8015M Anions by EPA 300.0/376.2/365.3 Cations by SW6010B TDS by EPA 160.1 TSS by EPA 160.2
Baseline*, Week # 1, Week # 4, Month # 2, Month # 3, and Quarterly	7	MW-1, MW-2, MW-3, MW-4, MW-5, MW-6, MW-7, MW-8, MW-9, MW-10, MW-15, and MW-16	Water	Groundwater Elevation
<b>Quarterly Groundwater Sampling</b>				
<u>Quarterly:</u> Baseline* and Quarterly	4	MW-1, MW-3 or MW-15, MW-5 or MW-16, MW-6, MW-7, and MW-8	Water Water Water Water Water	VOCs by SW8260B TPH-GROs by SW8015M Anions EPA 300.0/376.2/365.3 Cations by SW6010B
<u>Quarterly:</u> Baseline* and Quarterly	4	MW-1 MW-2, MW-3 or MW-15, MW-4, MW-5 or MW-16, MW-6, MW-7 MW-8 MW-9, and MW-10	Water Water Water Water Water	Alkalinity, total by EPA 310.1 Ammonia as Nitrogen by EPA 350.3 Biological Oxygen Demand by EPA 405.1 Iron & manganese, total & dissolved by SW6010B Methane by RSK 175

**Notes:**

- 1) \* Baseline sampling event will be conducted prior to sulfate injections.
- 2) VOC analyte list will include: benzene, toluene, ethylbenzene, xylenes, methyl tertiary butyl ether, tertiary butyl alcohol, and di-isopropyl ether.
- 3) Cation analyte list includes: barium, calcium, magnesium, manganese, potassium, and sodium.
- 4) Anion analyte list includes: bromide, iodide, chloride, sulfate, nitrate, nitrite, o-phosphate, and sulfide.
- 5) Acronyms:
  - TDS - total dissolved solids
  - TPH-GROs - total petroleum hydrocarbons-gasoline range organics
  - TSS - total suspended solids
  - VOCs - volatile organic compounds

**Table 2**  
**Well Construction Information Summary**  
**Government Gas Station, Building 631, NBVC Point Mugu Facility, Point Mugu, CA**

Well ID	Well Casing Elevation NAVD88 Feet	Well Description	Screen Interval (ft bgs)	NORTH CCS 1983 USFeet	EAST CCS 1983 USFeet	Well Info
MW-1	9.78	4" PVC	5 - 15	1864613.3	6228236.0	QRTR
MW-2	9.84	4" PVC	5 - 15	1864666.5	6228230.5	QRTR / WDR
MW-3	9.72	4" PVC	5 - 15	1864583.4	6228281.6	QRTR*
MW-4	9.8	4" PVC	5 - 15	1864565.4	6228176.9	QRTR / WDR
MW-5	9.7	4" PVC	5 - 15	1864636.3	6228136.8	QRTR*
MW-6	9.94	4" PVC	5 - 15	1864709.5	6228165.8	QRTR / INJN
MW-7	10.06	4" PVC	5 - 15	1864736.8	6228247.2	QRTR / INJN
MW-8	9.86	4" PVC	5 - 15	1864658.3	6228310.4	QRTR
MW-9	9.69	4" PVC	5 - 15	1864847.1	6228125.1	WDR
MW-10	9.61	4" PVC	5 - 15	1864863.4	6228243.0	WDR
MW-15	10.02	4" PVC	5 - 15	1864739.0**	6228122.8**	BSN*
MW-16	9.92	4" PVC	5 - 15	1864782.3**	6228260.4**	BSN*
IW-11	9.88	4" PVC	5 - 15	1864692.5**	6228183.8**	INJN
IW-12	9.77	4" PVC	5 - 15	1864677.6**	6228195.1**	INJN
IW-13	9.81	4" PVC	5 - 15	1864692.0**	6228239.1**	INJN
IW-14	9.81	4" PVC	5 - 15	1864713.7**	6228243.8**	INJN

**Notes:**

- 1) \* Wells MW-15 and MW-16 were sampled instead of MW-3 and MW-5 during July 2006 sampling event.  
 In October 2006, wells MW-15 and MW-16 were sampled instead of MW-9 and MW-10.  
 In February 2007, wells MW-9 and MW-10 were sampled instead of MW-15 and MW-16.  
 In April 2007, wells MW-9 and MW-10 were sampled instead of MW-15 and MW-16.
- 2) \*\* Wells MW-15, MW-16, IW-11 through IW-14 were surveyed July 28, 2006 by Sage Consultants, Inc.; Survey info:  
 Control Monument: NGS PID EW6326  
 Horizontal Datum: California Coordinate System 1983 (CCS1983)  
 Vertical Datum: NAVD88  
 Well Elevations are Top of inside Casing - North side
- 3) Wells MW-1 through MW-10 were surveyed on March 3, 2006 by Dulin and Boynton; Survey info is summarized below:  
 Benchmark: Vertical Datum NAVD88  
 NGS PID EW6435 triangulation station disk set in top of concrete monument stamped sick 1968  
 EW6435 Elevation= 9.43 feet NAVD88  
 Horizontal Datum NAD83  
 NGS PID stations AJ1892 AND AJ1906 NAD83
- 4) Acronyms and Abbreviations:  
 BSN - Baseline sampling  
 ft bgs - feet below ground surface  
 INJN - injection wells  
 QRTR - Quarterly sampling  
 WDR - Waste Discharge Requirements Permit



**Table 3**  
**Depth to Water and Groundwater Elevation Data**  
**Government Gas Station, Building 631, NBVC Point Mugu Facility, Point Mugu, CA**

Well ID	Sample Date	Sampling Event	Total Depth of Well (feet bmp)	Depth to Groundwater (feet bmp)	Casing Elevation (MSL)	Standing Water Column (feet)	Groundwater Elevation (MSL)
MW-1	9/9/02	3Qtr02	14.90	6.24	9.78	8.66	3.54
	12/5/02	4Qtr02	14.90	5.65	9.78	9.25	4.13
	3/17/03	1Qtr03	14.82	3.88	9.78	10.94	5.90
	12/11/03	4Qtr03	14.70	5.98	9.78	8.72	3.80
	9/27/04	3Qtr04	14.70	6.60	9.78	8.10	3.18
	7/24/06	3Qtr06	14.50	5.00	9.78	9.50	4.78
	10/23/06	Baseline and 4Qtr06	14.77	5.81	9.78	8.96	3.97
	2/1/07	Week #1	--	4.66	9.78	--	5.12
	2/20/07	Week #4 and 1Qtr07	14.55	4.92	9.78	9.63	4.86
	3/29/07	Month #2	15.00	5.30	9.78	9.70	4.48
	4/24/07	Month #3 and 2Qtr07	15.00	5.23	9.78	9.77	4.55
MW-2	9/9/02	3Qtr02	14.89	6.34	9.84	8.55	3.50
	12/5/02	4Qtr02	14.89	5.73	9.84	9.16	4.11
	3/17/03	1Qtr03	14.82	3.96	9.84	10.86	5.88
	12/11/03	4Qtr03	14.70	6.06	9.84	8.64	3.78
	9/27/04	3Qtr04	14.72	6.67	9.84	8.05	3.17
	7/24/06	3Qtr06	14.50	5.12	9.84	9.38	4.72
	10/23/06	Baseline and 4Qtr06	14.74	5.79	9.84	8.95	4.05
	2/1/07	Week #1	--	4.64	9.84	--	5.20
	2/20/07	Week #4 and 1Qtr07	14.57	5.02	9.84	9.55	4.82
	3/29/07	Month #2	15.00	5.39	9.84	9.61	4.45
	4/24/07	Month #3 and 2Qtr07	15.00	5.30	9.84	9.70	4.54
MW-3	9/9/02	3Qtr02	14.90	6.17	9.72	8.73	3.55
	12/5/02	4Qtr02	14.90	5.59	9.72	9.31	4.13
	3/17/03	1Qtr03	14.89	3.85	9.72	11.04	5.87
	12/11/03	4Qtr03	14.80	5.95	9.72	8.85	3.77
	9/27/04	3Qtr04	14.72	6.54	9.72	8.18	3.18
	7/24/06	3Qtr06	14.40	4.98	9.72	9.42	4.74
	10/23/06	Baseline and 4Qtr06	14.77	5.73	9.72	9.04	3.99
	2/1/07	Week #1	--	4.53	9.72	--	5.19
	2/20/07	Week #4 and 1Qtr07	14.56	4.89	9.72	9.67	4.83
	3/29/07	Month #2	15.00	5.23	9.72	9.77	4.49
	4/24/07	Month #3 and 2Qtr07	15.00	5.17	9.72	9.83	4.55
MW-4	9/9/02	3Qtr02	14.10	6.24	9.80	7.86	3.56
	12/5/02	4Qtr02	14.10	5.66	9.80	8.44	4.14
	3/17/03	1Qtr03	14.08	3.95	9.80	10.13	5.85
	12/11/03	4Qtr03	13.97	6.02	9.80	7.95	3.78
	9/27/04	3Qtr04	13.99	6.61	9.80	7.38	3.19
	7/24/06	3Qtr06	14.00	5.07	9.80	8.93	4.73
	10/23/06	Baseline and 4Qtr06	14.03	5.78	9.80	8.25	4.02
	2/1/07	Week #1	--	4.63	9.80	--	5.17
	2/20/07	Week #4 and 1Qtr07	14.83	5.00	9.80	9.83	4.80
	3/29/07	Month #2	15.00	5.33	9.80	9.67	4.47
	4/24/07	Month #3 and 2Qtr07	15.00	5.25	9.80	9.75	4.55
MW-4	7/10/07	3Qtr07	15.00	5.64	9.80	9.36	4.16

**Table 3 (Continued)**  
**Depth to Water and Groundwater Elevation Data**  
**Government Gas Station, Building 631, NBVC Point Mugu Facility, Point Mugu, CA**

Well ID	Sample Date	Sampling Event	Total Depth of Well feet bmp	Depth to Groundwater feet bmp	Casing Elevation MSL	Standing Water Column feet	Groundwater Elevation MSL
MW-5	9/9/02	3Qtr02	14.85	6.16	9.70	8.69	3.54
	12/5/02	4Qtr02	14.85	5.59	9.70	9.26	4.11
	3/17/03	1Qtr03	14.79	3.86	9.70	10.93	5.84
	12/11/03	4Qtr03	14.66	5.93	9.70	8.73	3.77
	9/27/04	3Qtr04	14.66	6.52	9.70	8.14	3.18
	7/24/06	3Qtr06	14.50	4.96	9.70	9.54	4.74
	10/23/06	Baseline and 4Qtr06	14.68	5.70	9.70	8.98	4.00
	2/1/07	Week #1	--	4.58	9.70	--	5.12
	2/20/07	Week #4 and 1Qtr07	14.51	4.86	9.70	9.65	4.84
	3/29/07	Month #2	15.00	5.14	9.70	9.86	4.56
	4/24/07	Month #3 and 2Qtr07	15.00	5.14	9.70	9.86	4.56
MW-6	7/10/07	3Qtr07	15.00	5.52	9.70	9.48	4.18
	3/17/03	1Qtr03	14.64	4.10	9.94	10.54	5.84
	12/11/03	4Qtr03	14.50	6.20	9.94	8.30	3.74
	9/27/04	3Qtr04	14.62	6.83	9.94	7.79	3.11
	7/24/06	3Qtr06	14.40	5.21	9.94	9.19	4.73
	10/23/06	Baseline and 4Qtr06	14.55	5.92	9.94	8.63	4.02
	2/1/07	Week #1	--	4.73	9.94	--	5.21
	2/20/07	Week #4 and 1Qtr07	14.41	5.11	9.94	9.30	4.83
	3/29/07	Month #2	15.00	5.47	9.94	9.53	4.47
MW-7	4/24/07	Month #3 and 2Qtr07	15.00	5.38	9.94	9.62	4.56
	7/10/07	3Qtr07	15.00	5.80	9.94	9.20	4.14
	3/17/03	1Qtr03	14.50	4.14	10.06	10.36	5.92
	12/11/03	4Qtr03	14.38	6.25	10.06	8.13	3.81
	9/27/04	3Qtr04	14.4	6.90	10.06	7.50	3.16
	7/24/06	3Qtr06	14.3	5.35	10.06	8.95	4.71
	10/23/06	Baseline and 4Qtr06	14.44	6.11	10.06	8.33	3.95
	2/1/07	Week #1	--	4.85	10.06	--	5.21
	2/20/07	Week #4 and 1Qtr07	14.21	5.25	10.06	8.96	4.81
MW-8	3/29/07	Month #2	15.00	5.60	10.06	9.40	4.46
	4/24/07	Month #3 and 2Qtr07	15.00	5.52	10.06	9.48	4.54
	7/10/07	3Qtr07	15.00	5.97	10.06	9.03	4.09
	3/17/03	1Qtr03	14.65	3.99	9.86	10.66	5.87
	12/11/03	4Qtr03	14.53	6.04	9.86	8.49	3.82
	9/27/04	3Qtr04	14.55	6.70	9.86	7.85	3.16
	7/24/06	3Qtr06	14.40	5.14	9.86	9.26	4.72
	10/23/06	Baseline and 4Qtr06	14.56	5.84	9.86	8.72	4.02
	2/1/07	Week #1	--	4.60	9.86	--	5.26
MW-8	2/20/07	Week #4 and 1Qtr07	14.41	5.05	9.86	9.36	4.81
	3/29/07	Month #2	15.00	5.42	9.86	9.58	4.44
	4/24/07	Month #3 and 2Qtr07	15.00	5.32	9.86	9.68	4.54
	7/10/07	3Qtr07	15.00	5.74	9.86	9.26	4.12

**Table 3 (Continued)**  
**Depth to Water and Groundwater Elevation Data**  
**Government Gas Station, Building 631, NBVC Point Mugu Facility, Point Mugu, CA**

Well ID	Sample Date	Sampling Event	Total Depth of Well feet bmp	Depth to Groundwater feet bmp	Casing Elevation MSL	Standing Water Column feet	Groundwater Elevation MSL
MW-9	12/11/03	4Qtr03	14.31	6.00	9.69	8.31	3.69
	9/27/04	3Qtr04	14.36	6.68	9.69	7.68	3.01
	7/24/06	3Qtr06	14.20	5.04	9.69	9.16	4.65
	10/23/06	Baseline and 4Qtr06	14.37	5.91	9.69	8.46	3.78
	2/1/07	Week #1	--	4.43	9.69	--	5.26
	2/20/07	Week #4 and 1Qtr07	14.21	4.88	9.69	9.33	4.81
	3/29/07	Month #2	15.00	5.24	9.69	9.76	4.45
	4/24/07	Month #3 and 2Qtr07	15.00	5.15	9.69	9.85	4.54
MW-10	7/10/07	3Qtr07	15.00	5.93	9.69	9.07	3.76
	12/11/03	4Qtr03	14.54	5.97	9.61	8.57	3.64
	9/27/04	3Qtr04	14.61	6.63	9.61	7.98	2.98
	7/24/06	3Qtr06	14.30	5.02	9.61	9.28	4.59
	10/23/06	Baseline and 4Qtr06	14.64	5.62	9.61	9.02	3.99
	2/1/07	Week #1	--	4.44	9.61	--	5.17
	2/20/07	Week #4 and 1Qtr07	14.45	4.22	9.61	10.23	5.39
	3/29/07	Month #2	15.00	5.36	9.61	9.64	4.25
MW-15	4/24/07	Month #3 and 2Qtr07	15.00	5.16	9.61	9.84	4.45
	7/10/07	3Qtr07	15.00	5.63	9.61	9.37	3.98
	7/24/06	3Qtr06	14.40	5.26	10.02	9.14	4.76
	10/23/06	Baseline and 4Qtr06	14.56	6.01	10.02	8.55	4.01
	2/1/07	Week #1	--	4.80	10.02	--	5.22
	2/20/07	Week #4 and 1Qtr07	14.42	5.19	10.02	9.23	4.83
	3/29/07	Month #2	15.00	5.54	10.02	9.46	4.48
MW-16	4/24/07	Month #3 and 2Qtr07	15.00	5.44	10.02	9.56	4.58
	7/10/07	3Qtr07	15.00	5.88	10.02	9.12	4.14
	7/24/06	3Qtr06	14.30	4.92	9.92	9.38	5.00
	10/23/06	Baseline and 4Qtr06	14.40	6.16	9.92	8.24	3.76
	2/1/07	Week #1	--	4.70	9.92	--	5.22
	2/20/07	Week #4 and 1Qtr07	14.29	5.09	9.92	9.20	4.83
	3/29/07	Month #2	15.00	5.29	9.92	9.71	4.63
	4/24/07	Month #3 and 2Qtr07	15.00	5.22	9.92	9.78	4.70
	7/10/07	3Qtr07	15.00	5.69	9.92	9.31	4.23

**Notes:**

- 1) "3Qtr02" - 3 indicates the third quarter (Qtr) of 2002 (02)
- 2) "--" -Not applicable and/or not available.

**Acronyms:**

bmp - below measuring point  
MSL - mean sea level

**Table 4**  
**Sodium Sulfate and Magnesium Sulfate Heptahydrate Injection Data**  
**Government Gas Station, Building 631, NBVC Point Mugu Facility, Point Mugu, CA**

Injection Well ID	Injection Date	Distance from Extraction Well MW-3 (feet)	Sodium Sulfate Dosage (pounds)	Magnesium Sulfate Heptahydrate Dosage (pounds)	Total Injected Volume of Water and Substrate Mixture (gallons)
IP-A	1/15/2007	95	--	25	400
IP-B	1/16/2007	100	--	25	400
IP-C	1/16/2007	75	--	25	400
IP-D	1/17/2007	65	--	25	400
IP-E	1/17/2007	70	--	25	400
MW-1	1/17/2007	50	--	25	400
MW-6	1/24/2007	165	35	--	400
MW-7	1/24/2007	150	35	--	400
IW-11	1/22/2007	140	35	--	400
IW-12	1/22/2007	125	35	--	400
IW-13	1/22/2007	115	35	--	400
IW-14	1/24/2007	125	35	--	400
<b>TOTAL:</b>			<b>210</b>	<b>150</b>	<b>4,800</b>

**Notes:**

1) Injection flow rates ranged from 4 gpm to 6.5 gpm except for IP-A, which was measured at 2 gpm.

2) All Injection pressures were less than 0.5 psig except for IP-A, which was measured at 13 psig.

3) Acronyms:

gpm - gallon per minute

psig - pound per square inch gauge

Table 5  
Groundwater Analytical Results  
Government Gas Station, Building 631, NBVC Point Mugu Facility, Point Mugu, CA

Well ID:			MW-1										MW-2												
Well Type and Location:			Quarterly Monitoring Well - Within Treatment Area										MRP No. CI-8906 Well - Within Treatment Area												
Sampling Event:			3Qtr02	4Qtr02	1Qtr03	4Qtr03	3Qtr04	3Qtr06	4Qtr06	1Qtr07	2Qtr07	3Qtr07	3Qtr02	4Qtr02	1Qtr03	4Qtr03	3Qtr04	3Qtr06	Baseline and 4Qtr06	Week#1	Week#4 and 1Qtr07	Month#2	Month #3 and 2Qtr07	3Qtr07	
Sample Date:			9/9/02	12/5/02	3/17/03	12/11/03	9/27/04	7/24/06	10/24/06	2/21/07	4/24/07	7/10/07	9/9/02	12/5/02	3/17/03	12/12/03	9/27/04	7/24/06	10/24/06	2/1/07	2/21/07	3/21/07	4/25/07	7/11/07	
Sample Type:			N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N		
Parameter	Method	Units																							
Total Petroleum Hydrocarbons - Gasoline Range Organics (C <sub>6</sub> -C <sub>10</sub> )	SW 8015M	µg/L	5,700	2,100	4,400	660	580	< 50	36 J	< 50	< 50	< 50	3,400	1,000	340	1,400	2,000	300	270 J	92	93	210	100	140	
BTEX Compounds																									
Benzene	SW 8260B	µg/L	94	42	39	27	69	< 0.5	< 0.5	0.39 J	< 0.5	< 0.5	300	110	21	180	390	23	52	< 0.5	4.8	11	8.4	38	
Ethylbenzene	SW 8260B	µg/L	1,300	500	310	130	64	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	260	150	25	96	140	1.3 J	1.9	< 0.5	25	60	5.1	0.91	
Toluene	SW 8260B	µg/L	2.8 J	1.2 J	1.4 J	< 0.5	0.63	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	1.3	0.72 J	< 0.5	0.6	0.97	< 2.5	0.22 J	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	
Xylenes	SW 8260B	µg/L	< 15	5.1 J	26	< 1.5	0.94 J	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 3.0	< 3.0	< 1.5	< 1.5	1.1	< 7.5	0.41 J	< 1.5	< 1.5	< 1.5	< 1.5	0.26 J	
Fuel Oxygenates																									
Methyl tert-Butyl Ether (MTBE)	SW 8260B	µg/L	1,500	810	330	68	61	6.4	6.4	5	7.9	3.5	250	130	66	140	120	48	33	25	30	33	28	36	
Tert-Butyl Alcohol (TBA)	SW 8260B	µg/L	460	340	190	710	280	< 20	120	< 20	27	16 J	110	180	240	190	70	84 J	140	160	150	93	< 20	160	
Diisopropyl Ether (DIPE)	SW 8260B	µg/L	< 20	< 10	< 10	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2	< 2.0	2.4 J	2.2 J	2.5	3.2	2.2	1.2 J	1.4J	1.8J	2.7	1.5 J	1.4 J	1.5 J	
Ethyl tert-Butyl Ether (ETBE)	SW 8260B	µg/L	< 20	< 10	< 10	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2	< 2.0	< 4.0	< 4.0	< 2.0	< 2.0	< 2.0	< 10	< 2.0	< 2.0	< 2.0	< 2.0	< 2	< 2.0	
Tert-Amyl Methyl Ether (TAME)	SW 8260B	µg/L	< 20	2.3 J	< 10	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2	< 2.0	< 4.0	< 4.0	< 2.0	< 2.0	< 2.0	< 10	< 2.0	< 2.0	< 2.0	< 2.0	< 2	< 2.0	
MNA Parameters																									
Alkalinity, Total	EPA 310.1	mg/L	--	--	--	--	1,100	285	695	505	530	--	--	--	--	--	1,100	1,310	910	--	815	--	990	--	
Ammonia as N	EPA 350.2	mg/L	--	--	--	--	0.37	0.338	0.539	0.309	0.35	--	--	--	--	--	0.13	0.398	0.267	--	0.363	--	1.35	--	
Biological Oxygen Demand	EPA 405.1	mg/L	--	--	--	--	< 5.0	2.3	< 2.0	3.17	< 2	--	--	--	--	--	5.2	7.91	4.24 J	--	5.11	--	--	--	
Iron, Dissolved <sup>a</sup>	SW 6010B	mg/L	--	1.38	7.13	1.80	3.50	0.0502 J	0.37	0.23	0.0821 J	--	--	0.10	< 0.10	0.21	0.58	0.24	0.165	--	0.558	--	0.141 J	--	
Iron, Total	SW 6010B	mg/L	--	--	--	--	7.8	2.3	9.7	0.9	1.49	--	--	--	--	--	12	2.5	1.6	--	1.22	--	3.9	3.07	
Methane, Dissolved	RSK 175	µg/L	620	680	2,800	1,100	1,900	660	610 J	380	80	340	3,200	1,200	940	2,100	2,800	3,400	2,100 J	--	1,800	--	1,900	3,100	
Total Dissolved Solids	EPA 160.1	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1,920	1,890	1,370	1,290	1,880	1,730	2,300	
Total Suspended Solids	EPA 160.2	mg/L	--	--	--	--	--	--	--	--	7 J	--	--	--	--	--	--	37	6.0	71	11	310	14	74.0	
Barium, Total	SW 6010B	mg/L	--	--	--	--	--	0.141	0.19	0.102	0.0976	--	--	--	--	--	--	0.458	0.428	0.299	0.29	0.544	0.376	0.436	
Calcium, Total	SW 6010B	mg/L	--	--	--	--	93	112	121	147	110	--	--	--	--	--	51	48.4	46.6	50.9	56.6	65.4	51	42.8	
Magnesium, Total	SW 6010B	mg/L	--	--	--	--	73	37.3	51.4	64.1	48.1	--	--	--	--	--	110	133	123	81.1	77.9	126	113	136	
Manganese, Dissolved <sup>b</sup>	SW 6010B	mg/L	--	0.47	0.54	< 0.5	0.26 J	0.15	0.158	0.0588	0.118		--	0.16	0.13	< 0.50	< 0.50	0.0864	0.0729	--	0.0781	--	0.0889	--	
Manganese, Total	SW 6010B	mg/L	--	--	--	--	0.39	0.17	0.18	0.06	0.108	--	--	--	--	--	0.11	0.12	0.08	0.09	0.0862	0.378	0.0879	0.0951	
Potassium, Total	SW 6010B	mg/L	--	--	--	--	40	29.4	39.5	31	28.3	--	--	--	--	--	43	55.1	53.6	42.9	43.3	51.9	55.4	54.4	
Sodium, Total	SW 6010B	mg/L	--	--	--	--	190	229	314	224	176	--	--	--	--	--	530	585	518	337	323	505	479	571	
Bromide	EPA 300.0	mg/L	--	--	--	--	--	1.54	< 0.5	0.658	0.682	--	--	--	--	--	--	4.03	2.08	1.63	1.42	2.45	2.06	3.09	
Chloride	EPA 300.0	mg/L	--	--	--	--	240	127	163	153	106	--	--	--	--	--	310	375	354	216	187	420	351	503	
Iodide	EPA 300.0	mg/L	--	--	--	--	--	< 0.5	< 0.5	< 0.5	< 0.5	--	--	--	--	--	--	0.704 J	1.04	0.621	0.606	0.6	< 0.5	< 0.5	
Nitrate	EPA 300.0	mg/L	--	< 1.0	< 0.2	< 0.1	< 0.1	3.25	0.31	16.10	0.244	0.358	--	< 1.0	< 0.2	0.29	< 0.1	< 0.1	0.11	< 0.1	0.102	0.0926 J	< 0.1	< 0.1	
Nitrite	EPA 300.0	mg/L	--	--	--	--	< 0.2	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	--	--	--	--	< 2.0	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	
o-Phosphate	EPA 365.3	mg/L	--	--	--	--	0.62	0.235	2.15	0.113	0.416	--	--	--	--	--	0.85	1.49	1.86	1	1.27	1.55	1.76	2.12	
Sulfate	EPA 300.0	mg/L	33	120	140	86	83	170	146	280	112	131	38	96	150	54	110	142	170	84.7	59.3	120	129	127	
Sulfide, Dissolved <sup>c</sup>	EPA 376.2	mg/L	--	< 0.1	< 0.1	< 0.05	< 0.05	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	--	0.2	0.1	0.2	< 0.05	0.321	0.609	0.536	0.348 J	0.245 J	0.806	0.413 J	
Field Measurements																									
pH	--	--	7.0	6.9	7.5	7.3	6.9	6.9	6.8	7.2	7.1	7.0	--	7.3	8.0	7.7	7.2	7.2	7.1	7.6	7.6	7.5	7.4	7.3	
ORP	--	mV	--	-156.2	-37.1	-235	-181.1	-75	-161	28	-67	-169	--	-173.20	-12.3	-241	-204.2	-209	-133	-145	-220	-147	-155	-218	
Temperature	--	°C	23.9	23.5	21.5	22.5	24.6	23.1	24.3	19.7	21.2	22.6	--	23.1	21.8	22.4	24.3	22.7	24.3	21.1	20.9	20.9	21.7	23.0	
Dissolved Oxygen	--	mg/L	--	*	1.25	0.07	0.07	0.78	1.38	0.22	3.25	0.00	--	*	0.87	0.10	0.04	0.72	1.64	0.00	0.25	0.84	0.10	0.11	

Notes:

- 1) "<" - Not detected above the stated reporting limit; "J" - Result was qualified as a quantitative estimate; "--" - Not applicable and/or not available  
2) **Bolded** results indicate positive detections.  
3) Sulfate injections were performed between January 15, 2007 and January 24, 2007.  
4) <sup>a</sup> - Reported as ferrous iron on 9/27/04; <sup>b</sup> - Reported as divalent manganese (Ion Chromatography) on 9/27/04; <sup>c</sup> - Reported as total sulfide on 7/24/06; \* Dissolved oxygen measurements were not collected due to meter malfunction  
5) Abbreviations:

µg/L - microgram per liter  
°C - degrees Celsius  
mg/L - milligram per liter  
mV - millivolt  
N - normal groundwater sample  
3Qtr02 - 3 indicates the third quarter (Qtr) of 2002 (02)

Table 5 (Continued)  
Groundwater Analytical Results  
Government Gas Station, Building 631, NBVC Point Mugu Facility, Point Mugu, CA

Well ID:			MW-3									MW-4											
Well Type and Location:			Quarterly Monitoring Well - Cross-gradient									MRP No. CI-8906 Well - Upgradient											
Sampling Event:			3Qtr02	4Qtr02	1Qtr03	4Qtr03	3Qtr04	4Qtr06	1Qtr07	2Qtr07	3Qtr07	3Qtr02	4Qtr02	1Qtr03	4Qtr03	3Qtr04	3Qtr06	Baseline and 4Qtr06	Week#1	Week#4 and 1Qtr07	Month#2	Month #3 and 2Qtr07	3Qtr07
Sample Date:			9/9/02	12/5/02	3/17/03	12/11/03	9/27/04	10/24/06	2/20/07	4/24/07	7/10/07	9/9/02	12/5/02	3/17/03	12/11/03	9/27/04	7/24/06	10/24/06	2/1/07	2/20/07	3/21/07	4/25/07	7/11/07
Sample Type:			N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Parameter	Method	Units																					
Total Petroleum Hydrocarbons - Gasoline Range Organics (C <sub>6</sub> -C <sub>10</sub> )	SW 8015M	µg/L	20	20	< 50	< 100	< 100	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 100	< 100	< 50	< 50	< 50	< 50	< 50	< 50	< 50
BTEX Compounds																							
Benzene	SW 8260B	µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.5	< 0.5	< 0.5	< 0.5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Ethylbenzene	SW 8260B	µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.5	< 0.5	< 0.5	< 0.5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Toluene	SW 8260B	µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.5	< 0.5	< 0.5	< 0.5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Xylenes	SW 8260B	µg/L	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Fuel Oxygenates																							
Methyl tert-Butyl Ether (MTBE)	SW 8260B	µg/L	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2	< 2.0
Tert-Butyl Alcohol (TBA)	SW 8260B	µg/L	< 20	< 20	< 20	< 20	< 10	< 20	< 20	< 20	< 20	< 20	< 20	< 10	< 2.0	< 10	< 20	< 20	< 20	< 20	< 20	< 20	< 20
Diisopropyl Ether (DIPE)	SW 8260B	µg/L	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2	< 2.0
Ethyl tert-Butyl Ether (ETBE)	SW 8260B	µg/L	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2	< 2.0
Tert-Amyl Methyl Ether (TAME)	SW 8260B	µg/L	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2	< 2.0
MNA Parameters																							
Alkalinity, Total	EPA 310.1	mg/L	--	--	--	--	650	475	435	440	--	--	--	--	--	360	282	265	--	275	--	290	--
Ammonia as N	EPA 350.2	mg/L	--	--	--	--	< 0.1	0.0361	0.214	0.291	--	--	--	--	--	< 0.10	0.269	0.56	--	0.0486 J	--	0.231	--
Biological Oxygen Demand	EPA 405.1	mg/L	--	--	--	--	6.7	3.91	< 2.0	< 2	--	--	--	--	--	5.2	6.5	1.66 J	--	< 2.0	--	--	--
Iron, Dissolved <sup>a</sup>	SW 6010B	mg/L	--	0.06	< 0.10	< 0.10	0.58	< 0.2	< 0.2	< 0.2	--	--	0.07	< 0.10	< 0.10	< 0.10	< 0.2	0.0651	--	0.178 J	--	0.173 J	--
Iron, Total	SW 6010B	mg/L	--	--	--	--	0.34	< 0.2	< 2.0	< 0.2	--	--	--	--	--	0.95	0.79	1.1	--	0.907	--	0.303	1.16
Methane, Dissolved	RSK 175	µg/L	0.34	< 0.50	8.3	< 2.0	< 2.0	0.85	< 2.0	< 2	< 2.0	0.4	4.1	1.3	9.4	7.2	28	41	--	2.4	--	2.2	3.3
Total Dissolved Solids	EPA 160.1	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	880	695	845	955	1,020	995	1,080
Total Suspended Solids	EPA 160.2	mg/L	--	--	--	--	--	--	--	< 10	--	--	--	--	--	--	12	< 10	< 10	< 10	< 10	< 10	8.00 J
Barium, Total	SW 6010B	mg/L	--	--	--	--	--	0.0628	0.0518	0.0446	--	--	--	--	--	--	0.0409	0.0383	0.0511	0.0481	0.0439	0.0475	0.0540
Calcium, Total	SW 6010B	mg/L	--	--	--	--	100	87.6	86.4	77.5	--	--	--	--	--	85	121	78.3	98	119	129	136	137
Magnesium, Total	SW 6010B	mg/L	--	--	--	--	74	61.6	60.9	55.2	--	--	--	--	--	58	51.3	53	58	60.9	60.7	64.7	65.2
Manganese, Dissolved <sup>b</sup>	SW 6010B	mg/L	--	0.006	0.01	< 0.50	< 0.50	0.0553	0.0137	0.0126	--	--	0.12	0.20	< 0.50	0.16 J	0.32	0.166	--	0.023	--	0.279	--
Manganese, Total	SW 6010B	mg/L	--	--	--	--	0.34	0.22	0.07	0.0362	--	--	--	--	--	0.48	0.45	0.26	0.15	0.0902	0.0983	0.299	0.250
Potassium, Total	SW 6010B	mg/L	--	--	--	--	53	46.4	41.6	40.7	--	--	--	--	--	370	35.4	37	36	37.6	35.6	42.2	40.8
Sodium, Total	SW 6010B	mg/L	--	--	--	--	500	418	387	374	--	--	--	--	--	720	96.5	79	83	93	92.9	103	109
Bromide	EPA 300.0	mg/L	--	--	--	--	--	1.45	1.48	1.28	--	--	--	--	--	--	< 0.5	0.4	0.438 J	0.425 J	0.453 J	< 0.5	0.573
Chloride	EPA 300.0	mg/L	--	--	--	--	310	199	226	185	--	--	--	--	--	67	40	43	37	40.6	47.7	51.3	54.5
Iodide	EPA 300.0	mg/L	--	--	--	--	--	< 0.5	< 0.5	< 0.5	--	--	--	--	--	--	< 0.5	0.351	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Nitrate	EPA 300.0	mg/L	--	17.00	0.09	2.60	3.80	4.07	4.16	4.39	4.34	--	< 1.0	0.10	< 0.1	< 0.1	< 0.1	0.119	0.213	0.248	0.201	0.0805 J	0.123
Nitrite	EPA 300.0	mg/L	--	--	--	--	< 5.0	< 0.1	< 0.1	< 0.1	< 0.1	--	--	--	--	< 2.0	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
o-Phosphate	EPA 365.3	mg/L	--	--	--	--	< 0.3	0.152	0.141	0.14	--	--	--	--	--	< 0.3	0.191	0.219	0.158	0.127	0.113	0.131	0.185
Sulfate	EPA 300.0	mg/L	540	680	320	600	660	482	549	444	514	200	290	340	190	290	323	213	313	417	471	393	460
Sulfide, Dissolved <sup>c</sup>	EPA 376.2	mg/L	--	< 0.1	< 0.1	< 0.05	< 0.05	< 0.5	< 0.5	< 0.5	< 0.5	--	< 0.1	< 0.1	< 0.05	< 0.05	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Field Measurements																							
pH	--	--	7.4	7.3	7.7	7.8	7.5	7.2	7.7	7.6	7.5	7.4	7.2	7.6	7.5	7.4	7.2	7.0	7.6	7.4	7.44	7.3	7.3
ORP	--	mV	--	142.20	96.7	173	120	82	31	92	66	--	-71.2	29.8	-52	-79.6	-128	-34	122	-46	0.98	10	-59
Temperature	--	°C	25.1	22.9	21.6	22.3	26.2	25.0	19.8	21.4	25.3	23.5	22.9	21.2	22.1	23.9	22.0	23.7	20.5	20.1	20.2	20.9	22.2
Dissolved Oxygen	--	mg/L	--	*	0.84	2.37	3.59	6.54	2.95	3.79	2.48	--	*	0.64	0.00	0.26	0.65	1.61	0.00	0.43	0.95	0.00	0.05

Notes:

- 1) "<" - Not detected above the stated reporting limit; "J" - Result was qualified as a quantitative estimate; "--" - Not applicable and/or not available  
2) **Bolded** results indicate positive detections.  
3) Sulfate injections were performed between January 15, 2007 and January 24, 2007.  
4) <sup>a</sup> - Reported as ferrous iron on 9/27/04; <sup>b</sup> - Reported as divalent manganese (Ion Chromatography) on 9/27/04; <sup>c</sup> - Reported as total sulfide on 7/24/06; \* Dissolved oxygen measurements were not collected due to meter malfunction  
5) Abbreviations:

µg/L - microgram per liter  
°C - degrees Celsius  
mg/L - milligram per liter  
mV - millivolt  
N - normal groundwater sample  
3Qtr02 - 3 indicates the third quarter (Qtr) of 2002 (02)

Table 5 (Continued)  
Groundwater Analytical Results  
Government Gas Station, Building 631, NBVC Point Mugu Facility, Point Mugu, CA

Well ID:			MW-5									MW-6								MW-7				
Well Type and Location:			Quarterly Monitoring Well - Cross-gradient									Quarterly Monitoring Well - Within Treatment Area								Quarterly Monitoring Well - Within Treatment Area				
Sampling Event:			3Qtr02	4Qtr02	1Qtr03	4Qtr03	3Qtr04	4Qtr06	1Qtr07	2Qtr07	3Qtr07	1Qtr03	4Qtr03	3Qtr04	3Qtr06	4Qtr06	1Qtr07	2Qtr07	3Qtr07	1Qtr03	4Qtr03	3Qtr04	3Qtr06	4Qtr06
Sample Date:			9/9/02	12/5/02	3/17/03	12/11/03	9/27/04	10/24/06	2/21/07	4/24/07	7/10/07	3/17/03	12/12/03	9/27/04	7/25/06	10/23/06	2/20/07	4/24/07	7/10/07	3/18/03	12/12/03	9/27/04	7/25/06	10/24/06
Sample Type:			N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Parameter	Method	Units																						
Total Petroleum Hydrocarbons - Gasoline Range Organics (C <sub>6</sub> -C <sub>10</sub> )	SW 8015M	µg/L	< 50	< 50	< 50	< 100	< 100	< 50	< 50	< 50	< 50	3,300	1,400	6,100	230	110 J	< 50	< 50	< 50	94	< 100	< 100	< 50	< 50
BTEX Compounds																								
Benzene	SW 8260B	µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.5	< 0.5	0.24 J	< 0.5	< 0.5	2,100	620	2,700	< 0.5	89	< 0.5	< 0.5	0.25 J	< 0.50	< 0.50	< 0.5	< 0.5	< 0.5
Ethylbenzene	SW 8260B	µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.5	1.0	< 0.5	1.4	< 0.5	660	200	890	< 0.5	14	< 0.5	< 0.5	< 0.5	< 0.50	< 0.50	< 0.5	< 0.5	< 0.5
Toluene	SW 8260B	µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	4.1 J	0.98	6.1	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.50	< 0.50	< 0.5	< 0.5	< 0.5
Xylenes	SW 8260B	µg/L	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	440	49	373	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Fuel Oxygenates																								
Methyl tert-Butyl Ether (MTBE)	SW 8260B	µg/L	< 2.0	0.54 J	1.1 J	< 2.0	< 2.0	< 2.0	< 2.0	< 2	< 2.0	< 20	< 2.0	0.65 J	0.29 J	1.4J	0.84	0.39 J	0.30 J	65	39	16	3.9	12
Tert-Butyl Alcohol (TBA)	SW 8260B	µg/L	< 20	< 20	< 20	< 10	< 10	< 20	< 20	< 20	< 20	< 20	< 2.0	< 10	< 20	8.4J	12	< 20	< 20	650	400	130	15 J	85
Diisopropyl Ether (DIPE)	SW 8260B	µg/L	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2	< 2.0	< 20	< 2.0	1.8 J	0.88 J	2.4J	1.5	0.75 J	0.56 J	3.9	2.2	< 2.0	0.32 J	0.86 J
Ethyl tert-Butyl Ether (ETBE)	SW 8260B	µg/L	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2	< 2.0	< 20	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Tert-Amyl Methyl Ether (TAME)	SW 8260B	µg/L	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2	< 2.0	< 20	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
MNA Parameters																								
Alkalinity, Total	EPA 310.1	mg/L	--	--	--	--	710	635	625	558	--	--	--	1,500	953	1,240	840	1,070	--	--	--	1,100	764	825
Ammonia as N	EPA 350.2	mg/L	--	--	--	--	< 0.1	0.0414	0.0367 J	0.0573 J	--	--	--	< 0.1	0.219	0.115	0.179	0.0736 J	--	--	--	< 0.1	0.179	0.366
Biological Oxygen Demand	EPA 405.1	mg/L	--	--	--	--	< 5.0	< 2.0	4.33	< 2	--	--	--	17	1.75 J	5.74	3.32	< 2	--	--	--	< 5.0	< 2.0	< 2.0
Iron, Dissolved <sup>a</sup>	SW 6010B	mg/L	--	0.07	< 0.10	< 0.10	< 0.1	0.121 J	0.205	0.252	--	< 0.10	0.12	0.37	0.0881 J	0.26	2.54	1.12	--	< 0.10	< 0.10	< 0.1	< 0.2	< 0.2
Iron, Total	SW 6010B	mg/L	--	--	--	--	1.1	0.746	2.5	4	--	--	--	0.65	0.27	0.31	3.01	1.3	--	--	--	0.69	0.0801 J	0.232
Methane, Dissolved	RSK 175	µg/L	1.4	4.9	32	5.4	2.0 J	8.5 J	22	38	16	2,500	440	8,600	840	3,400 J	680	390	340	190	< 2.0	140	5.4	27 J
Total Dissolved Solids	EPA 160.1	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Suspended Solids	EPA 160.2	mg/L	--	--	--	--	--	--	--	< 10	--	--	--	--	--	--	--	6 J	--	--	--	--	--	--
Barium, Total	SW 6010B	mg/L	--	--	--	--	--	0.13	0.173	0.145	--	--	--	--	0.095	0.0782	0.0405	0.0521	--	--	--	--	0.127	0.128
Calcium, Total	SW 6010B	mg/L	--	--	--	--	100	88.2	110	87.6	--	--	--	27	28.9	18.7	15.7	21.0	--	--	--	46	72.7	52.4
Magnesium, Total	SW 6010B	mg/L	--	--	--	--	60	53.1	64.2	55	--	--	--	50	47.4	34.0	14.6	29.9	--	--	--	91	96	95.5
Manganese, Dissolved <sup>b</sup>	SW 6010B	mg/L	--	0.02	0.07	< 0.50	< 0.50	0.0326 J	0.0182	0.0492	--	0.06	< 0.50	< 0.50	0.0523	0.0513	0.051	0.0669	--	0.10	< 0.50	0.15 J	0.06	0.415
Manganese, Total	SW 6010B	mg/L	--	--	--	--	0.16	0.127	0.502	0.534	--	--	--	0.08 D	0.0628	0.0562	0.0525	0.0707	--	--	--	0.97	0.19	1.42
Potassium, Total	SW 6010B	mg/L	--	--	--	--	35	31.2	27.1	25.1	--	--	--	55	50.5	44.4	21.1	28.1	--	--	--	73	83.5	82.1
Sodium, Total	SW 6010B	mg/L	--	--	--	--	190	283	222	214	--	--	--	640	653	695	774	790	--	--	--	1,200	1,210	1,260
Bromide	EPA 300.0	mg/L	--	--	--	--	--	0.73	0.586	0.584	--	--	--	--	3.26	2.1	1.88	2.68	--	--	--	--	6.72	4.87
Chloride	EPA 300.0	mg/L	--	--	--	--	130	83.1	109	86.3	--	--	--	440	333	301	270	389	--	--	--	2,400	1,330	1,210
Iodide	EPA 300.0	mg/L	--	--	--	--	--	< 0.5	< 0.5	< 0.5	--	--	--	--	0.856	< 0.5	0.794	< 2.5	--	--	--	--	< 0.5	1.37
Nitrate	EPA 300.0	mg/L	--	10.00	< 0.2	2.70	3.10	5.26	7.37	6.32	6.58	< 0.2	0.40	< 0.1	0.782	0.352	0.0943 J	0.492 J	0.553	< 0.2	0.52	< 0.2	0.532	0.272
Nitrite	EPA 300.0	mg/L	--	--	--	--	< 0.2	< 0.1	< 0.1	< 0.1	< 0.1	--	--	< 0.5	< 0.1	< 0.1	< 0.1	< 0.5	< 0.1	--	--	< 0.5	< 0.1	< 0.1
o-Phosphate	EPA 365.3	mg/L	--	--	--	--	< 0.3	0.112	0.0533 J	0.0809 J	--	--	--	2.6	1.63	3.55	4.09	2.54	--	--	--	0.92	0.503	0.854
Sulfate	EPA 300.0	mg/L	83	270	470	340	280	147	117	153	144	47	82	84	278	91.8	339	289	291	160	270	1600	577	544
Sulfide, Dissolved <sup>c</sup>	EPA 376.2	mg/L	--	< 0.1	< 0.1	< 0.05	< 0.05	< 0.5	< 0.5	< 0.5	< 0.5	< 0.1	< 0.05	< 0.05	< 0.5	0.114 J	< 0.5	< 0.5	< 0.5	< 0.1	< 0.05	< 0.05	< 0.5	< 0.5
Field Measurements																								
pH	--	--	7.0	7.0	7.8	7.3	7.0	6.9	7.2	7.1	7.1	8.4	8.1	8.0	7.7	7.8	8.2	7.8	7.7	8.2	7.9	7.5	7.2	7.4
ORP	--	mV	--	-18.9	105.7	112	69.9	72	75	-3	53	42.6	-258	-211.1	- 125	-156	-161	-168	-141	93.4	-109	-130.9	84	41
Temperature	--	°C	23.7	22.9	21.5	22.4	24.3	24.7	19.4	21.4	23.9	21.5	22.4	24.0	22.5	24.0	20.6	21.1	22.4	21.9	22.6	24.2	22.7	24.1
Dissolved Oxygen	--	mg/L	--	*	0.82	0.89	0.82	5.11	1.88	1.59	2.25	1.57	0.18	0.26	1.72	2.35	0.30	0.34	0.00	0.82	0.05	0.08	1.26	3.95

Notes:

- 1) "<" - Not detected above the stated reporting limit; "J" - Result was qualified as a quantitative estimate; "--" - Not applicable and/or not available  
2) **Bolded** results indicate positive detections.  
3) Sulfate injections were performed between January 15, 2007 and January 24, 2007.  
4) <sup>a</sup> - Reported as ferrous iron on 9/27/04; <sup>b</sup> - Reported as divalent manganese (Ion Chromatography) on 9/27/04; <sup>c</sup> - Reported as total sulfide on 7/24/06; \* Dissolved oxygen measurements were not collected due to meter malfunction  
5) Abbreviations:

µg/L - microgram per liter  
°C - degrees Celsius  
mg/L - milligram per liter  
mV - millivolt  
N - normal groundwater sample  
3Qtr02 - 3 indicates the third quarter (Qtrr) of 2002 (02)

Table 5 (Continued)  
Groundwater Analytical Results  
Government Gas Station, Building 631, NBVC Point Mugu Facility, Point Mugu, CA

Well ID:			MW-7 (Continued)			MW-8							MW-9								
Well Type and Location:			Quarterly Monitoring Well - Within Treatment Area			Quarterly Monitoring Well - Cross-gradient							MRP No. CI-8906 Well - Downgradient								
Sampling Event:			1Qtr07	2Qtr07	3Qtr07	1Qtr03	4Qtr03	3Qtr04	3Qtr06	4Qtr06	1Qtr07	2Qtr07	3Qtr07	4Qtr03	3Qtr04	3Qtr06	Week#1	Week#4 and 1Qtr07	Month#2	Month #3 and 2Qtr07	3Qtr07
Sample Date:			2/20/07	4/24/07	7/10/07	3/18/03	12/12/03	9/27/04	7/25/06	10/24/06	2/20/07	4/24/07	7/10/07	12/11/03	9/27/04	7/24/06	2/1/07	2/20/07	3/21/07	4/25/07	7/11/07
Sample Type:			N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Parameter	Method	Units																			
Total Petroleum Hydrocarbons - Gasoline Range Organics (C <sub>6</sub> -C <sub>10</sub> )	SW 8015M	µg/L	< 50	< 50	< 50	40	< 100	< 100	< 50	< 50	< 50	< 50	< 50	< 100	< 100	< 50	< 50	< 50	< 50	< 50	< 50
BTEX Compounds																					
Benzene	SW 8260B	µg/L	< 0.5	< 0.5	< 0.5	< 0.50	< 0.50	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Ethylbenzene	SW 8260B	µg/L	< 0.5	< 0.5	< 0.5	< 0.50	< 0.50	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Toluene	SW 8260B	µg/L	< 0.5	< 0.5	< 0.5	< 0.50	< 0.50	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Xylenes	SW 8260B	µg/L	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Fuel Oxygenates																					
Methyl tert-Butyl Ether (MTBE)	SW 8260B	µg/L	12	11	7.4	41	9.7	0.95 J	0.27 J	8.1	3	4.6	3.2	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2	< 2.0
Tert-Butyl Alcohol (TBA)	SW 8260B	µg/L	97	39	42	23	< 10	< 10	< 20	11	< 20	< 20	< 20	< 10	< 10	< 20	< 20	< 20	< 20	< 20	< 20
Diisopropyl Ether (DIPE)	SW 8260B	µg/L	0.82	0.7 J	0.50 J	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2	< 2.0
Ethyl tert-Butyl Ether (ETBE)	SW 8260B	µg/L	< 2.0	< 2	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2	< 2.0
Tert-Amyl Methyl Ether (TAME)	SW 8260B	µg/L	< 2.0	< 2	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2	< 2.0
MNA Parameters																					
Alkalinity, Total	EPA 310.1	mg/L	640	805	--	--	--	780	642	505	465	610	--	--	760	656	--	555	--	670	--
Ammonia as N	EPA 350.2	mg/L	0.357	0.231	--	--	--	< 0.1	0.229	0.0623	0.286	0.122	--	--	0.12	0.114	--	0.315	--	0.624	--
Biological Oxygen Demand	EPA 405.1	mg/L	< 2.0	< 2	--	--	--	< 5	< 2.0	< 2.0	2.82	< 2	--	--	< 5.0	2	--	< 2.0	--	--	--
Iron, Dissolved <sup>a</sup>	SW 6010B	mg/L	0.131 J	0.0668 J	--	< 0.1	< 0.1	< 0.1	< 0.2	< 0.2	0.0437 J	< 0.2	--	< 0.10	0.14	< 0.2	--	0.0852 J	--	0.0472 J	--
Iron, Total	SW 6010B	mg/L	0.397	0.144 J	--	--	--	0.80	0.0735 J	0.0552 J	0.197 J	0.136 J	--	--	1.4	0.449	--	0.385	--	2.83	0.779
Methane, Dissolved	RSK 175	µg/L	26	7.8	13	6.0	< 2.0	500	42	330 J	810	260	320	4.3	6.2	0.9	--	3	--	6.5	11
Total Dissolved Solids	EPA 160.1	mg/L		--	--	--	--	--	--	--	--	--	--	--	--	3,170	3,680	3,360	3,840	3,790	4,240
Total Suspended Solids	EPA 160.2	mg/L		< 10	--	--	--	--	--	--	--	< 10	--	--	--	15	35	10	14	174	26.0
Barium, Total	SW 6010B	mg/L	0.0675	0.0802	--	--	--	--	0.0527	0.0388	0.0359	0.0352	--	--	--	0.046	0.0524	0.0431	0.0444	0.0547	0.0507
Calcium, Total	SW 6010B	mg/L	33.2	44.7	--	--	--	28	72.2	41.1	36.6	45.5	--	--	77	52	49.2	56.2	44.1	52.0	52.8
Magnesium, Total	SW 6010B	mg/L	34.5	69.8	--	--	--	42	70.7	50.3	43.0	54.1	--	--	100	70	77.7	73.3	77.2	83.7	94.3
Manganese, Dissolved <sup>b</sup>	SW 6010B	mg/L	0.139	0.292	--	0.15	< 0.50	< 0.50	0.0114	0.0753	0.0687	0.0265	--	< 0.50	0.12 J	0.271	--	0.509	--	0.644	--
Manganese, Total	SW 6010B	mg/L	1.29	0.451	--	--	--	0.83	0.123	0.195	0.341	0.152	--	--	0.37	0.337	0.738	0.541	0.752	0.591	0.639
Potassium, Total	SW 6010B	mg/L	35.7	57.2	--	--	--	49	54.9	52.2	48.2	49.0	--	--	75.0	66.3	65.8	65.6	61.4	84.0	76.9
Sodium, Total	SW 6010B	mg/L	874	1,080	--	--	--	750	563	587	444	517	--	--	1,200	998	1,170	1,000	1,200	1,170	1,580
Bromide	EPA 300.0	mg/L	2.12	4.84	--	--	--	--	3.25	2.00	1.38	1.98	--	--	--	4.04	4.61	4.02	5.12	4.68	5.98
Chloride	EPA 300.0	mg/L	425	1,130	--	--	--	420	398	342	232	335	--	--	1,500	896	1,090	976	1,310	1,230	1,470
Iodide	EPA 300.0	mg/L	< 0.5	< 0.5	--	--	--	--	< 0.5	0.877	< 0.5	< 0.5	--	--	--	0.818	< 0.5	< 0.5	< 0.5	< 0.5	0.796
Nitrate	EPA 300.0	mg/L	0.119	0.326	0.251	< 0.2	0.23	0.12	0.557	0.254	0.130	0.190	0.234	< 0.1	< 0.2	< 0.1	< 0.1	0.145	< 0.1	< 0.1	< 0.1
Nitrite	EPA 300.0	mg/L	< 0.1	< 0.1	< 0.1	--	--	< 0.5	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	--	< 10	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.2
o-Phosphate	EPA 365.3	mg/L	1.720	0.669	--	--	--	0.51	0.32	0.702	0.858	0.668	--	--	0.9	0.617	1.38	1.27	1.15	1.36	1.30
Sulfate	EPA 300.0	mg/L	950	542	608	400	450	410	500	403	347	455	473	640	970	628	959	883	911	868	1,000
Sulfide, Dissolved <sup>c</sup>	EPA 376.2	mg/L	< 0.5	< 0.5	< 0.5	< 0.1	< 0.05	< 0.05	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.05	< 0.05	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Field Measurements																					
pH	--	--	7.9	7.6	7.5	7.6	7.8	7.4	7.2	7.3	7.6	7.5	7.6	7.9	7.6	7.2	7.6	7.6	7.5	7.3	7.3
ORP	--	mV	-29	66	-16	141.7	-108	-149.1	31	-12	-137	-61	-76	-178	-89.9	15	-84	14	-34	-24	-104
Temperature	--	°C	20.8	21.5	22.5	21.8	22.1	23.8	22.2	24.2	21.2	21.4	22.3	22.3	23.5	22.0	20.6	20.8	20.6	--	22.2
Dissolved Oxygen	--	mg/L	0.32	0.26	0.00	0.51	0.40	0.14	2.07	1.96	0.46	1.12	0.06	0.08	0.35	0.50	0.00	0.26	0.79	0.07	0.64

Notes:

- 1) "<" - Not detected above the stated reporting limit; "J" - Result was qualified as a quantitative estimate; "--" - Not applicable and/or not available
- 2) **Bolded** results indicate positive detections.
- 3) Sulfate injections were performed between January 15, 2007 and January 24, 2007.
- 4) <sup>a</sup> - Reported as ferrous iron on 9/27/04; <sup>b</sup> - Reported as divalent manganese (Ion Chromatography) on 9/27/04; <sup>c</sup> - Reported as total sulfide on 7/24/06; \* Dissolved oxygen measurements were not collected due to meter malfunction
- 5) Abbreviations:
- µg/L - microgram per liter
  - °C - degrees Celsius
  - mg/L - milligram per liter
  - mV - millivolt
  - N - normal groundwater sample
  - 3Qtr02 - 3 indicates the third quarter (Qtrr) of 2002 (02)



Table 5 (Continued)  
Groundwater Analytical Results  
Government Gas Station, Building 631, NBVC Point Mugu Facility, Point Mugu, CA

Well ID:			MW-10								MW-15		MW-16		IP-C		IP-D
Well Type and Location:			MRP No. CI-8906 Well - Downgradient								Downgradient		Downgradient		Within Excavation Area		Within Excavation Area
Sampling Event:			4Qtr03	3Qtr04	3Qtr06	Week#1	Week#4 and 1Qtr07	Month#2	Month #3 and 2Qtr07	3Qtr07	3Qtr06	4Qtr06	3Qtr06	4Qtr06	1Qtr07**	3Qtr07	3Qtr07
Sample Date:			12/11/03	9/27/04	7/24/06	2/1/07	2/20/07	3/21/07	4/25/07	7/11/07	7/25/06	10/23/06	7/25/06	10/23/06	1/15/07	7/11/07	7/11/07
Sample Type:			N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Parameter	Method	Units															
Total Petroleum Hydrocarbons - Gasoline Range Organics (C <sub>6</sub> -C <sub>10</sub> )	SW 8015M	µg/L	< 100	< 100	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	335 **	< 50	350
BTEX Compounds																	
Benzene	SW 8260B	µg/L	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	64.6	< 0.5	7.0
Ethylbenzene	SW 8260B	µg/L	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	1.3	< 0.5	1.1
Toluene	SW 8260B	µg/L	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 1.0	< 0.5	0.90
Xylenes	SW 8260B	µg/L	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 3.0	< 1.5	3.0
Fuel Oxygenates																	
Methyl tert-Butyl Ether (MTBE)	SW 8260B	µg/L	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	37.4	< 2.0	0.45 J
Tert-Butyl Alcohol (TBA)	SW 8260B	µg/L	< 10	< 10	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 10	< 20	< 20
Diisopropyl Ether (DIPE)	SW 8260B	µg/L	< 2.0	< 2.0	0.32 J	0.35 J	0.34 J	0.3 J	0.38 J	0.43 J	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Ethyl tert-Butyl Ether (ETBE)	SW 8260B	µg/L	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Tert-Amyl Methyl Ether (TAME)	SW 8260B	µg/L	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
MNA Parameters																	
Alkalinity, Total	EPA 310.1	mg/L	--	560	807	--	695	--	725	--	420	390	748	700	--	--	--
Ammonia as N	EPA 350.2	mg/L	--	0.14	1.47	--	0.143	--	0.774	--	< 0.1	0.0574 J	1.02	0.547 J	--	--	--
Biological Oxygen Demand	EPA 405.1	mg/L	--	< 5.0	2.54	--	2.1	--	--	--	< 2.0	3.37	3.66	< 2.0	--	--	--
Iron, Dissolved <sup>a</sup>	SW 6010B	mg/L	< 0.10	0.19	0.0893 J	--	0.0902 J	--	< 0.2	--	0.226	< 0.2	0.12 J	0.0446 J	--	--	--
Iron, Total	SW 6010B	mg/L	--	4.0	1.78	--	1.62	--	1.04	2.17	0.587	0.0834 J	0.454	0.0932 J	--	--	--
Methane, Dissolved	RSK 175	µg/L	20	100	17	--	3.7	--	15	13	< 2.0	< 2.0	4	4.4 J	--	0.71 J	19
Total Dissolved Solids	EPA 160.1	mg/L	--	--	8,000	4,540	3,700	5,580	6,150	8,060	--	1,280	--	2,970	--	--	--
Total Suspended Solids	EPA 160.2	mg/L	--	--	42	90	128	21	16	31.0	--	5.0	--	6.0	--	--	--
Barium, Total	SW 6010B	mg/L	--	--	0.0469	0.0372	0.0229	0.0383	0.0427	0.0485	0.0558	0.0589	0.0785	0.0706	--	--	--
Calcium, Total	SW 6010B	mg/L	--	120	162	64.3	52.6	94.7	127	161	27	27	51	55	--	--	--
Magnesium, Total	SW 6010B	mg/L	--	190	231	104	94	154	199	240	22	29	58	71	--	--	--
Manganese, Dissolved <sup>b</sup>	SW 6010B	mg/L	0.72	0.69	1.5	--	0.341	--	1.37	--	0.0154	< 0.5	0.228	0.4	--	--	--
Manganese, Total	SW 6010B	mg/L	--	1.6	1.75	0.593	0.350	0.853	1.36	2.01	22	0.00473 J	0.26	0.40	--	--	--
Potassium, Total	SW 6010B	mg/L	--	87	108	71.3	74.2	85.6	123.0	108	28	35	66	72	--	--	--
Sodium, Total	SW 6010B	mg/L	--	1,500	2,310	1,400	1,310	1,700	1,930	2,480	261	431	796	951	--	--	--
Bromide	EPA 300.0	mg/L	--	--	11.1	6.44	5.69	7.56	8.46	11.5	1.37	1.27	4.38	3.43	--	--	--
Chloride	EPA 300.0	mg/L	--	2,100	2,520	1,540	1,450	2,000	2,220	2,840	153	323	752	868	--	--	--
Iodide	EPA 300.0	mg/L	--	--	0.908	< 0.5	0.599	0.547	< 0.5	1.06	< 0.5	< 0.5	0.519	0.818	--	--	--
Nitrate	EPA 300.0	mg/L	< 0.1	< 0.5	0.0994 J	0.0915 J	0.131	0.0994 J	< 0.1	< 0.1	4.75	2.84	0.136	0.231	--	--	--
Nitrite	EPA 300.0	mg/L	--	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.5	< 0.1	< 0.1	< 0.1	< 0.1	--	--	--
o-Phosphate	EPA 365.3	mg/L	--	1.2	1.14	1.94	1.81	1.39	1.66	1.65	0.22	0.29	0.977	0.778	--	--	--
Sulfate	EPA 300.0	mg/L	990	1,200	1,780	1,230	1,030	1,460	1,620	2,050	103	156	455	551	50.9	522	602
Sulfide, Dissolved <sup>c</sup>	EPA 376.2	mg/L	< 0.05	< 0.05	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	--	< 0.5	0.349 J
Field Measurements																	
pH	--	--	7.9	7.5	7.2	7.8	7.7	7.6	7.4	7.3	7.5	7.4	7.2	7.2	--	7.3	7.1
ORP	--	mV	-152	-86	- 85	60	-114	-61	-90	-98	96	111	- 117	34	--	-211	-166
Temperature	--	°C	21.6	23.2	22.1	20.4	20.5	20.1	21.0	22.2	23.9	24.1	24.1	24.9	--	24.0	23.8
Dissolved Oxygen	--	mg/L	0.00	0.25	0.82	0.00	0.29	0.97	2.38	0.21	3.60	6.47	0.71	3.34	--	0.27	0.09

Notes:

- 1) "<" - Not detected above the stated reporting limit; "J" - Result was qualified as a quantitative estimate; "--" - Not applicable and/or not available  
2) **Bolded** results indicate positive detections.  
3) Sulfate injections were performed between January 15, 2007 and January 24, 2007.  
4) <sup>a</sup> - Reported as ferrous iron on 9/27/04; <sup>b</sup> - Reported as divalent manganese (Ion Chromatography) on 9/27/04; <sup>c</sup> - Reported as total sulfide on 7/24/06; \* Dissolved oxygen measurements were not collected due to meter malfunction  
5) \*\* - Sample was analyzed by American Scientific Laboratories, Inc. and not by EMAX Laboratories, Inc. "335 ug/L" is reported as total petroleum hydrocarbons as gasoline (C4 - C12) by SW 8260B  
6) Abbreviations:  
µg/L - microgram per liter  
°C - degrees Celsius  
mg/L - milligram per liter  
mV - millivolt  
N - normal groundwater sample  
3Qtr02 - 3 indicates the third quarter (Qtr) of 2002 (02)

Table 6  
Quality Control Field Duplicate Results  
Government Gas Station, Building 631, NBVC Point Mugu Facility, Point Mugu, CA

				Analyte:	TPH-GROs	Benzene	Ethylbenzene	Toluene	Xylenes	MTBE	TBA	DIPE	ETBE	TAME
				Method:	SW 8015M	SW 8260B	SW 8260B	SW 8260B	SW 8260B	SW 8260B	SW 8260B	SW 8260B	SW 8260B	SW 8260B
				Units:	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Well I.D.	Sampling Event	Sample Date	Sample Type											
MW-1	1Qtr03	3/17/03	N	4,400	39	310	1.4 J	26	330	190	<10	<10	<10	
		3/17/03	FD	4,700	37	310	1.3 J	25	310	180	<10	<10	<10	
	3Qtr04	9/27/04	N	580	69	64	0.63	0.94 J	61	280	< 2.0	< 2.0	< 2.0	
		9/27/04	FD	220	39	33	<0.50	<1.5	44	450	< 2.0	< 2.0	< 2.0	
MW-2	3Qtr02	9/9/02	N	3,400	300	260	1.3	<3.0	250	110	2.4 J	<4.0	<4.0	
		9/9/02	FD	3,000	320	250	1.1	<3.0	270	94	2.3 J	<4.0	<4.0	
	4Qtr02	12/5/02	N	1,000	110	150	0.72 J	<3.0	130	180	2.2 J	<4.0	<4.0	
		12/5/02	FD	1,100	110	150	0.72 J	<3.0	130	180	2.3 J	<4.0	<4.0	
	3Qtr06	7/24/06	N	300	23	1.3 J	< 2.5	< 7.5	48	84 J	1.2 J	< 10	< 10	
		7/24/06	FD	270	25	1.5	0.32 J	0.48 J	46	94 J	1.6 J	< 2.0	< 2.0	
	Baseline and 4Qtr06	10/24/06	N	270 J	52	1.9	0.22 J	0.41 J	33	140	1.4J	< 2.0	< 2.0	
		10/24/06	FD	270 J	50	2.2	< 0.5	0.4 J	32	130	1.3J	< 2.0	< 2.0	
	Week #4 and 1Qtr07	2/21/07	N	93	4.8	25	<0.5	<1.5	30	150	2.7	<2.0	<2.0	
		2/21/07	FD	100	6.6	35	<0.5	<1.5	31	170	2.9	<2.0	<2.0	
	Month #3 and 2Qtr07	4/25/07	N	100	8.4	5.1	< 0.5	< 1.5	28	< 20	1.4 J	< 2	< 2	
		4/25/07	FD	110	11	5.9	< 0.5	< 1.5	28	< 20	1.4 J	< 2	< 2	
MW-6	4Qtr03	7/11/07	N	140	38	0.91	< 0.50	0.26 J	36	160	1.5 J	< 2.0	< 2.0	
		7/11/07	FD	170	36	1.0	0.20 J	0.25 J	34	150	1.6 J	< 2.0	< 2.0	
	4Qtr03	12/12/03	N	1,400	620	200	0.98	49	<2.0	<2.0	<2.0	<2.0	<2.0	
		12/12/03	FD	1,500	600	230	0.99	56	<2.0	<2.0	<2.0	<2.0	<2.0	

**Notes:**

1) "<" - Not detected above the stated reporting limit; "J" - Result was qualified as a quantitative estimate; "--" - Not applicable and/or not available

2) **Bolded** results indicate positive detections.

3) **Acronyms and Abbreviations:**

µg/L - microgram per liter

DIPE - diisopropyl ether

ETBE - ethyl tert-butyl ether

FD - field duplicate sample

MTBE - methyl tert-butyl ether

N - normal groundwater sample

TAME - tert-amyl methyl ether

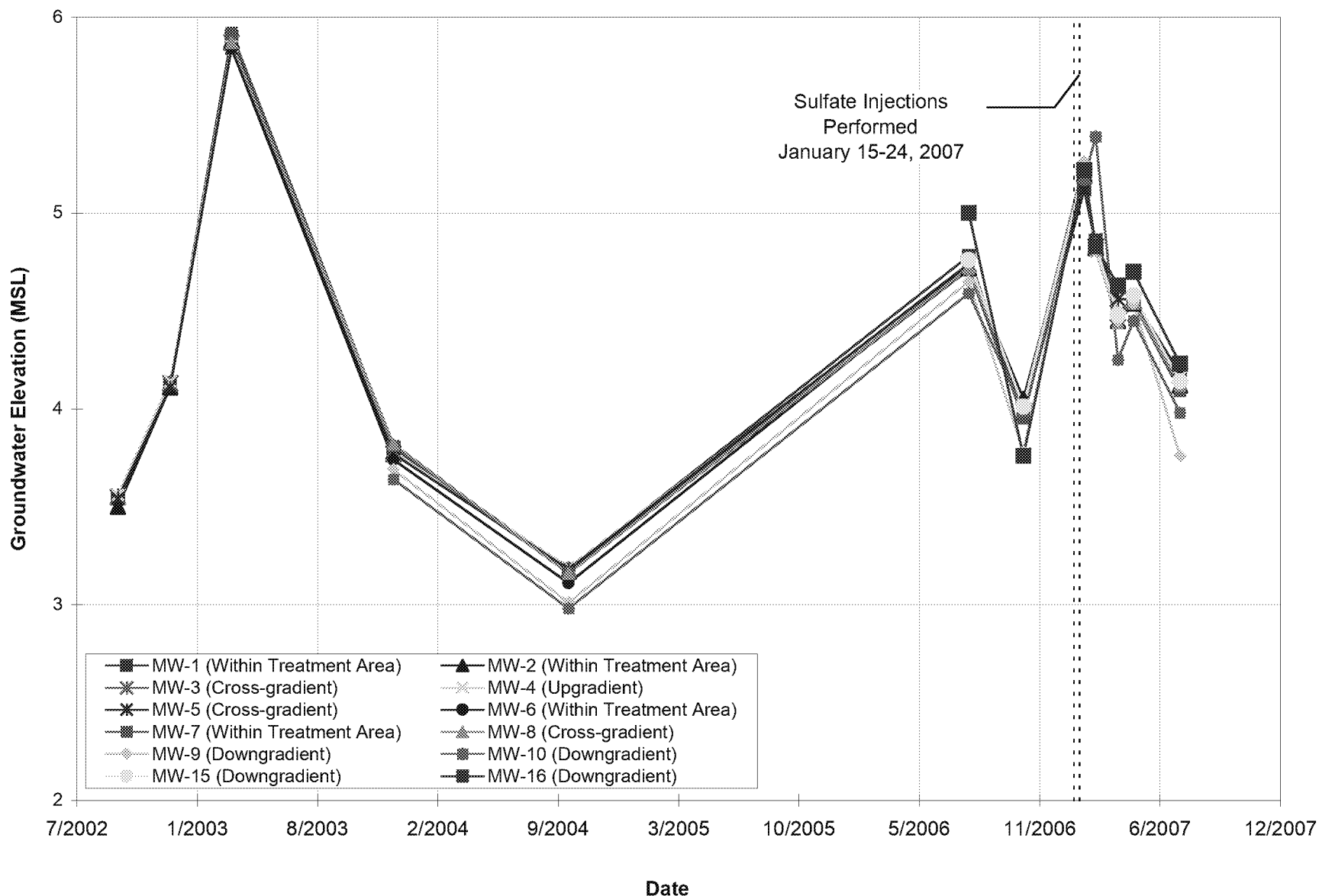
TBA - tert-butyl alcohol

TPH-GROs - total petroleum hydrocarbons-gasoline range organics

3Qtr02 - 3 indicates the third quarter (Qtr) of 2002 (02)

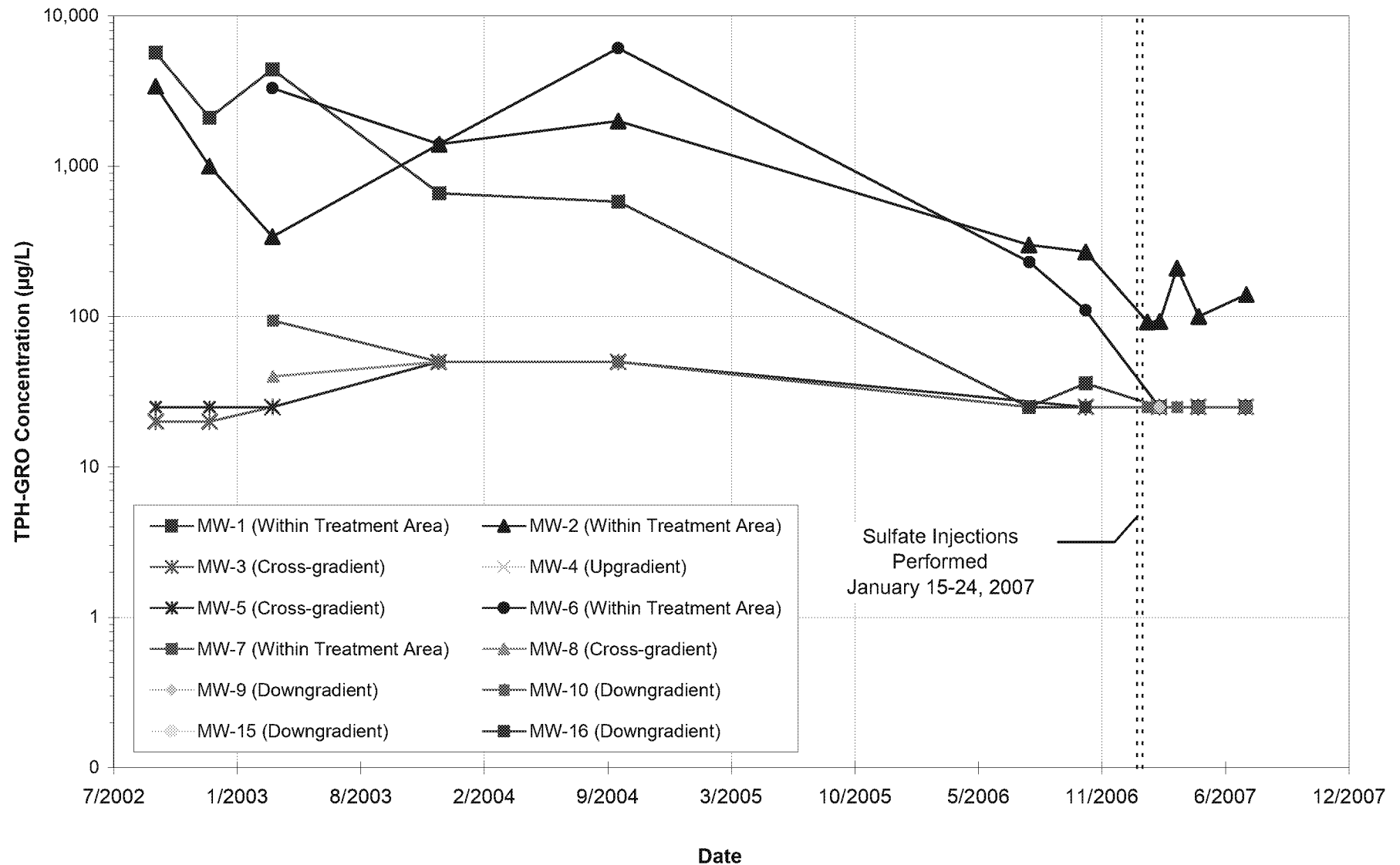
## Graphs

**Graph 1**  
**Hydrograph for Historical Groundwater Elevation Data for Groundwater Monitoring Wells, 2002-2007**  
**Government Gas Station, Building 631, NBVC Point Mugu Facility, Point Mugu, CA**



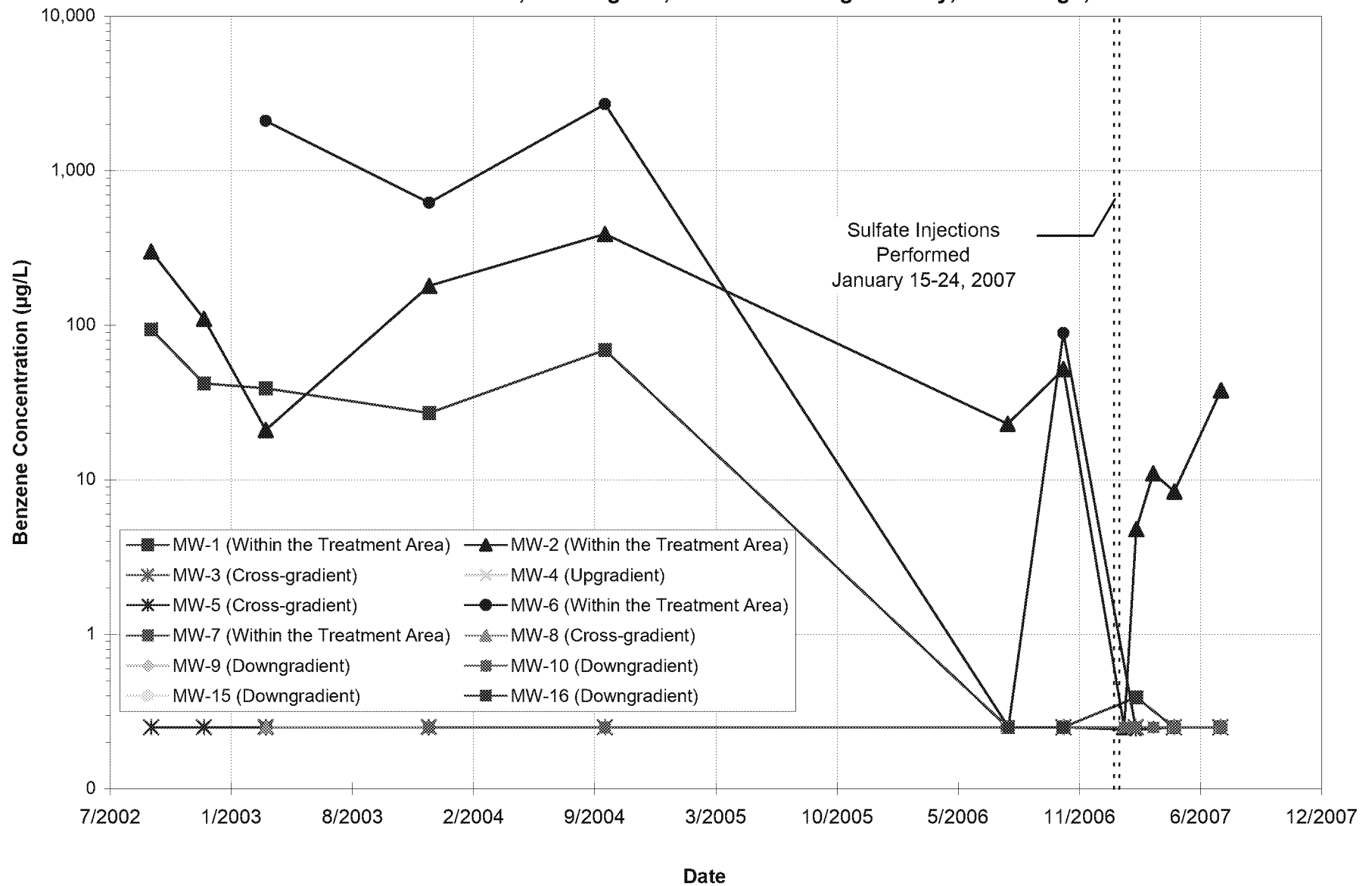
Data were collected by URS, Inc. between September 2002 and September 2004. After July 2006, data were collected by T N & Associates, Inc.

**Graph 2**  
**Total Petroleum Hydrocarbons-Gasoline Range Organics Concentrations for**  
**Selected Groundwater Monitoring Wells, 2002-2007**  
**Government Gas Station, Building 631, NBVC Point Mugu Facility, Point Mugu, CA**



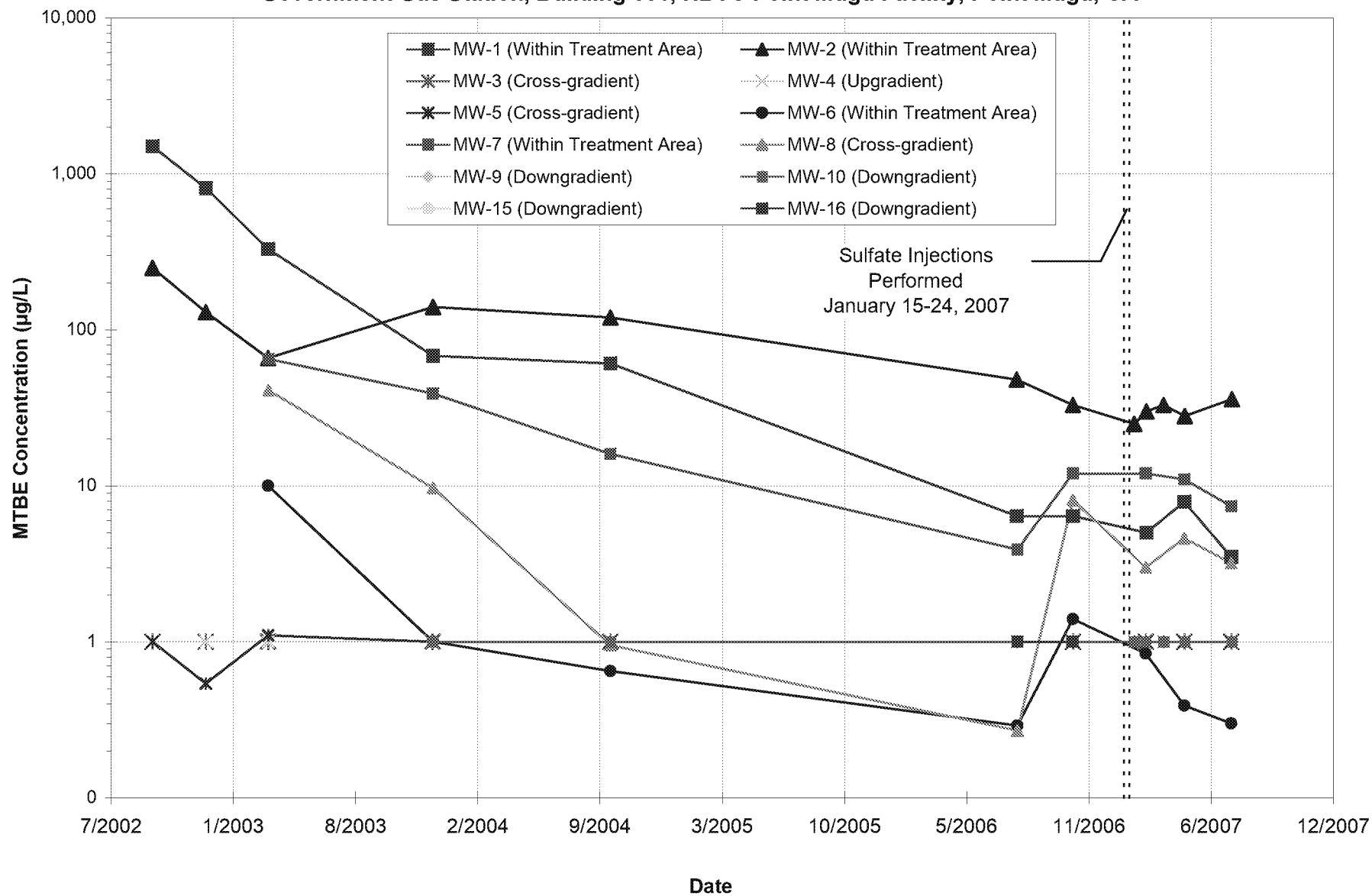
Data were collected by URS, Inc. between September 2002 and September 2004. After July 2006, data were collected by T N & Associates, Inc.

**Graph 3**  
**Benzene Concentrations for Selected Groundwater Monitoring Wells, 2002-2007**  
**Government Gas Station, Building 631, NBVC Point Mugu Facility, Point Mugu, CA**



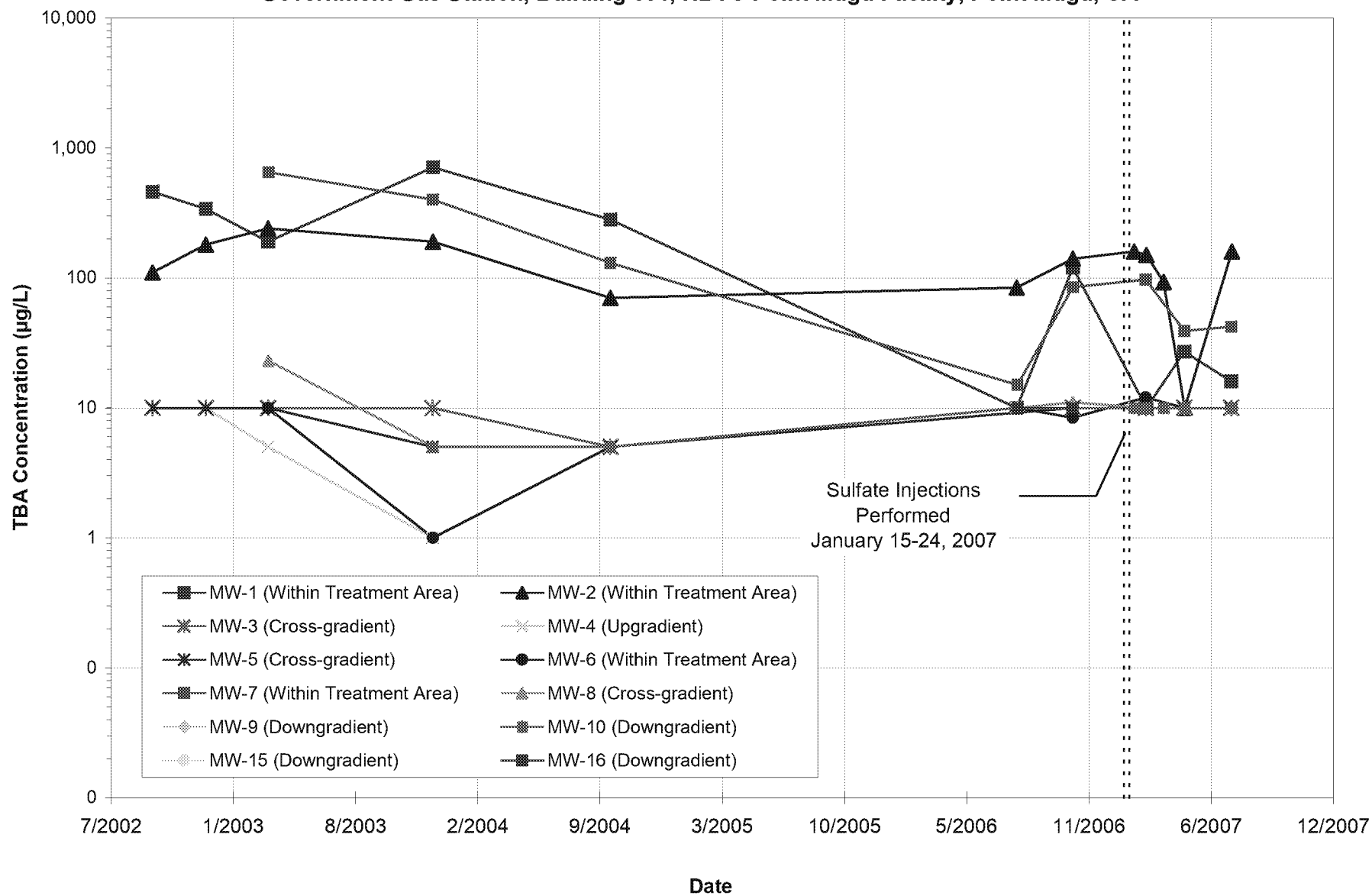
Data were collected by URS, Inc. between September 2002 and September 2004. After July 2006, data were collected by T N & Associates, Inc.

**Graph 4**  
**Methyl Tert-Butyl Ether Concentrations for Selected Groundwater Monitoring Wells, 2002-2007**  
**Government Gas Station, Building 631, NBVC Point Mugu Facility, Point Mugu, CA**



Data were collected by URS, Inc. between September 2002 and September 2004. After July 2006, data were collected by T N & Associates, Inc.

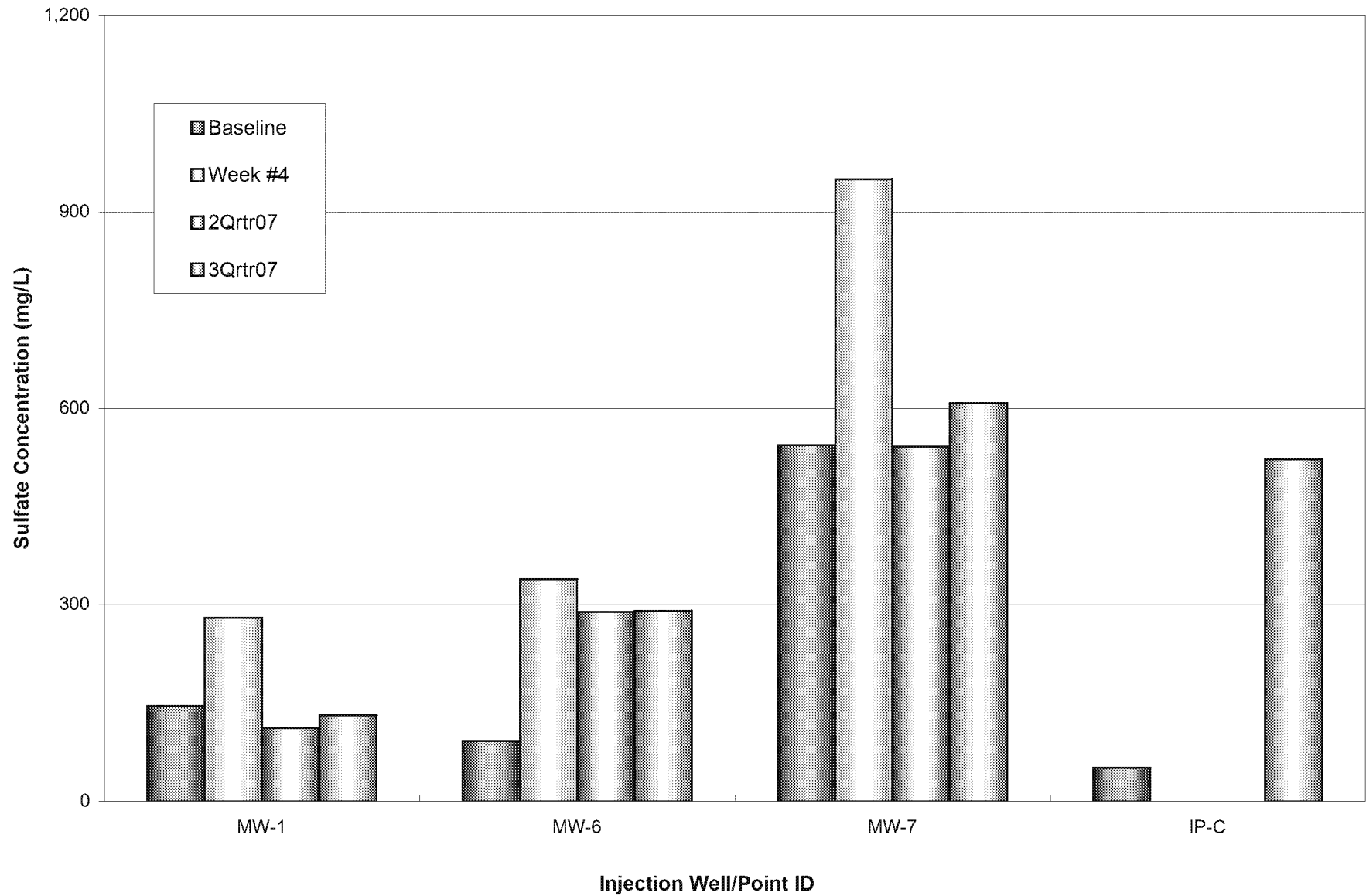
**Graph 5**  
**Tert-Butyl Alcohol Concentrations for Selected Groundwater Monitoring Wells, 2002-2007**  
**Government Gas Station, Building 631, NBVC Point Mugu Facility, Point Mugu, CA**



Data were collected by URS, Inc. between September 2002 and September 2004. After July 2006, data were collected by T N & Associates, Inc.



**Graph 6**  
**Baseline and Post-Injection Sulfate Concentrations in Injection Wells**  
**Government Gas Station, Building 631, NBVC Point Mugu Facility, Point Mugu, CA**



**Graph 7**  
**Baseline and Post-Injection Sulfate Concentrations in Monitoring Wells**  
**Government Gas Station, Building 631, NBVC Point Mugu Facility, Point Mugu, CA**

